THE CADUCEUS

JOURNAL OF THE HONGKONG UNIVERSITY MEDICAL SOCIETY.

Vol. 11 November, 1932. No. 4

All medical papers and other scientific contributions intended for the Journal, and all books for review and magazines in exchange, should be addressed to the Editor. "*Caduceus*," Hong Kong University, Hong Kong.

Changes of address of members of the Society and all business communications should be sent to the Business Manager, "*Caduceus*," Hong Kong University; Hong Kong.

CLINICAL REPORT OF THE TSAN YUK HOSPITAL AND OF THE MATERNITYY BUNGALOW, GOVERNMENT CIVIL HOSPITAL. BEING THE WORK OF THE SCHOOL OF MIDWIFERY OF HONG KONG UNIVERSITY.

by

Professor R. E. Tottenham, M.D.

Dr. D. K. Pillai and Dr. S. K. Lam.

MATERNITY DEPARTMENT.

During the year ended 30th April 1932, there was a total of 1927 admissions to the Maternity wards under our care. Of these—1809 were delivered, 650 being primiparae and 1,159 being multiparae The total live births numbered 1,700: and of the 109 cases in which the child was not born alive, its death was attributable to the following causes:—

Abortion and miscarriage	23
Vesicular mole	1
Decomposition (macerated)	26
Prematurity	12
Various causes	47

There were 10 maternal deaths, thus giving a maternal mortality rate of .55% approximately, in 1809 confinements.

The combined morbidity rate of the two hospitals was 7.4%.

We wish to take this opportunity of thanking The Hon. Dr. S. W. T'so (Chairman of the Tsan Yuk Hospital Committee) for having organised a fund for the purchase of radium for this hospital, and for his courtesy to us at all times. And we also wish to thank the (anonymous) donor who was good enough to open the radium fund with a generous cheque for $1,000.

During the year there have been no changes of note, the work of the University Clinic being carried on both in the Tsan Yuk Hospital and the Government Civil Hospital. Students attend cases in both hospitals, and have usually no difficulty in obtaining credit for 50 or more, during their period of attendance at the hospital. Students are also permitted to visit and examine cases at the Gynaecological Dispensary (Out-patient Department) of the Government Civil Hospital, and as the attendance is large, there is an unusual opportunity for them to acquire a practical knowledge of diagnostic methods including bimanual examination. Students on maternity duty are also permitted to visit the ante-natal clinic, and be present in the hospital wards during the examination of patients.

The following were the principal obstetrical operations and complications—

Forceps.

The forceps were applied 48 times, giving a frequency of one in every 37.5 cases. The indications were as follows:—

Delayed 2nd stage	39
Prolapse of cord	2
Placenta praevia	3
Eclampsia	1
Uterine inertia	1
Face presentation	1
Pre-eclampsia (retinitis)	1

In five cases the infant was dead when extracted, the death being due to—

Prolapse of cord	1 case
Placenta praevia	2 cases
Pre-eclampsia	1 case
Delayed labour	1 case

When considering the infant or foetal mortality rate in South China, the incidence of syphilis must be born in mind—samples of blood taken from the umbilical cord show a positive wassermann in 8% to 10% of all cases. In addition to syphilis being common, extremely few of the patients attend hospital sufficiently often to receive a complete course of treatment.

Breech.

There were 60 cases of breech presentation, (17 in primiparae, and 43 in multiparae); 22 babies were born dead, tne causes of death being as follows:—

Macerated	7 cases
Prematurity	3 cases
Miscarrriage	1 case

Other Causes.

Hydrocephalus	1 case
Placenta praevia	6 cases

Death following internal version one case. One death occurred in a twin pregnancy. Full term 2 cases. (One baby was born asphyxiated, one decomposed baby).

Placenta Praevia.

This condition occurred in 20 patients, there were no maternal deaths, but only five infants were born alive. The placenta was central in 9 cases, marginal in 6 cases and lateral in 5 cases.

During the year we have made no essential change in our routine treatment, the majority of cases being treated by Bi-polar version, in three cases however in which the placenta was situated laterally and rather high up, the membranes were ruptured and labour was allowed to proceed normally. In two other cases (1 central, and 1 marginal) traction was applied to the scalp by the aid of two light volsella, which act in a somewhat similar manner to a Willett forceps.

During the last five years we have had a series of 64 cases without a maternal death (one case admitted with a ruptured uterus excluded see Table). Our foetal mortality rate, unfortunately, has been high; but this cannot be wondered at when one realises that out of these 64 cases in only 17 had pregnancy lasted for 36 or more weeks. In many cases the Chinese patients only seek admission to hospital when frightened by the occurrence of a sharp attack of haemorrhage, a factor which has influenced us in the choice of our treatment.

Although there is an ante-natal clinic at both of the Hospitals, it is only attended by a very small proportion of the patients who ultimately seek admission to the labour wards. The position in our clinic is somewhat different to that of other Clinics where the bulk of the cases have been carefully watched throughout pregnancy; and there is a prospect of occasionally meeting a central placenta praevia,—under conditions which would justify caesarean section.

Accidental Haemorrhage.

This condition occurred five times, four of the infants were born alive, but three of the mothers died, but in only one of the three cases could the death be attributed directly to haemorrhage. The haemorrhage was of the concealed variety in one case, external in two cases, and combined in two. The causes of death were as follows:—

L. C. Concealed accidental haemorrhage, postpartum haemorrhage.

F. died on the 7th day—pulmonary embolus.

A. T. died on the 9th day—uraemia.

Our routine treatment of accidental haemorrhage has undergone no change during the year. The membranes are ruptured, and pituitrin is given in most cases, plugging of the vagina is reserved for those cases which it is believed will not respond to more simple treatment, but we are glad to say we have not plugged a case for some time.

We find that patients who have suffered from accidental haemorrhage, are very liable to collapse, or even to die during or soon after the 3rd stage of labour, a fact which should always be born in mind when treating such cases.

Prolapse and Presentation of the Cord.

This condition occurred twice, both mothers recovered, one of the infants was stillborn.

Destructive Operations on the Foetus.

There were four of these operations performed, the indications were as follows:—

Hydrocephalus	1 case
Pelvic contraction with transverse presentation, and prolapse of hand	1 case
Pelvic contraction, prolonged labour, dead foetus	1 case

There was one case of placenta praevia in which the cervix closed down on the after-coming head (foetus 30 weeks, no foetal heart heard).

The head was perforated but not crushed.

Rupture of the Uterus.

One case was admitted in which the uterus was ruptured along its entire length from the cervix to the level of the round ligaments on the antero-lateral aspect. Forceps had been applied before admission —the presentation being a face with chin posterior.

The abdomen was opened in the middle line, the foetal head was found outside the tear of the uterus. Rupture closed with 2 layers of catgut sutures.

The patient made a good recovery.

Two patients were admitted with deep tears of the cervix which extended up into the lower uterine segment. In both instances the injury occurred during attempts at delivery before admission. The particulars may be seen in table No. XIV.b. In one case (a placenta praevia), the rupture was associated with a transverse presentation. The patient unfortunately died.

In the second case—the rent appeared to have been caused by the attempts of a midwife to deliver the 2nd baby in a case of twins, the

Figure 2. Pelvic deformity resulting from old standing tubercular disease of the hip.


101R

first baby she succeeded in extracting, but the presentation of the second was a transverse. The rent which was bleeding profusely was stitched, and the uterus plugged—the patient lived; but the tear in this case was not so deep, nor the patient so collapsed as in the case of placenta praevia.

Caesarean Section.

This operation was performed twice.

The indication in one case being extreme atresia of the vagina following trauma at a previous delivery, the lower segment operation was performed when the patient was in labour—mother recovered, and child alive. We have referred to this type of case elsewhere (Journal of Obstetrics and Gynaecology of the British Empire Vol. 39, No. 3, 1932) Atresia of the vagina is very common in South China, it is usually the result of trauma during labour, the injury being caused by the midwife, or handiwoman in attempting to extract the child with a species of sharp hook.

The indication for caesarean section in the second case was contracted pelvis.

Eclampsia.

There were three cases of eclampsia during the year. All the mothers recovered, and all the children were born alive. One patient had eleven fits, the other two patients had one and two fits respectively. There has been no essential change in treatment during the year. Tweedy's treatment being closely followed with the exception that instead of pushing the morphia, rectal ether is given with paraldehyde.

Mortality.

There were altogether ten maternal deaths, in 1809 deliveries giving a percentage mortality rate of .55% approximately. In those cases in which death was directly attributable to pregnancy, labour, or the puerperium, the cause of death was as follows:—

1. L.C. age 41, Cause of death. Accidental haemorrhage, postpartum haemorrhage.
2. L.Y.P. age 33, Cause of death. Puerperal septicaemia.
3. W.T.S. age 42, Cause of death. Rupture of uterus, placenta praevia, shock.
4. L.K.S. age 20, Cause of death. Pulmonary embolus.
5. C.O.K. age 18, Cause of death. Acute cystitis, septicaemia.
6. C.P.S. age 25, Cause of death. Abdominal pregnancy (full term) —peritonitis.

Deaths not directly attributable to pregnancy, labour, or puerperium.

7. L.M. age 47, Cause of death. Beri-beri.

8. G. age 24, Cause of death. Myocarditis, pulmonary oedema.

9. A.T. age 37, Cause of death. Uraemia.

10. C.M. age 23, Cause of death. Cerebro spinal meningitis.

Extra-uterine Pregnancy with survival of the foetus beyond the usual limits.

These cases are included in the maternity reports, because pregnancy had existed sufficiently long for the foetus to be viable, although one was only about 28 weeks. Such cases are usually regarded as being exceedingly rare, and therefore it is somewhat of a concidence that we have had four in the last two years. It is almost impossible to form any estimate of the proportion of cases in which it is possible to remove the sac completely or alternatively to deal with the placental site simply, and efficiently. The pariticulars are as follows:—

C.P.S.—Age 25. Has one child which was born three years ago. She gave a history of Amenorrhoea for about 11½ months, and stated that she had had an attack of abdominal pain (lasting 10 days) about six months before admissilon. When she came to hospital, she complained of giddiness, nausea, abdominal pain, and bleeding (slight) from the vagina for about three hours. Subsequently the pain became more severe, and was associated with vomiting; the abdomen became distended, a fluid thrill was perceptible, and the pulse rose to 132 per minute.

On examination the abdomen was found to be enlarged to the size of a full term pregnancy; foetal parts were readily palpable, the "lie" being somewhat transverse. By vaginal examination the uterus appeared to be of normal non pregnant size, this was confirmed by passing a uterine sound. Some fragments of tissue resembling decidua came away. The foetal heart was not heard. The abdomen was opened under general anaesthesia, and the foetus was found lying free in the abdomen, only covered by the amnion, which had ruptured. The placenta was attached to the remains of the left tube and was quite easily removed. The foetus was dead but not yet macerated; it weighed 7½ pounds. The placenta weighed 2½ pounds. The patient unfortunately died of peritonitis on the third day.

Apparently in this case the infection was due to the escape of septic liquor amnii into the abdominal cavity, because some little time after admission to hospital, there was a general aggravation of the patients symptoms, i.e. severe pain in the abdomen, vomiting distention, and increased pulse rate; and at operation, it was evident that the membranes had only recently been torn. (See Figure 5).

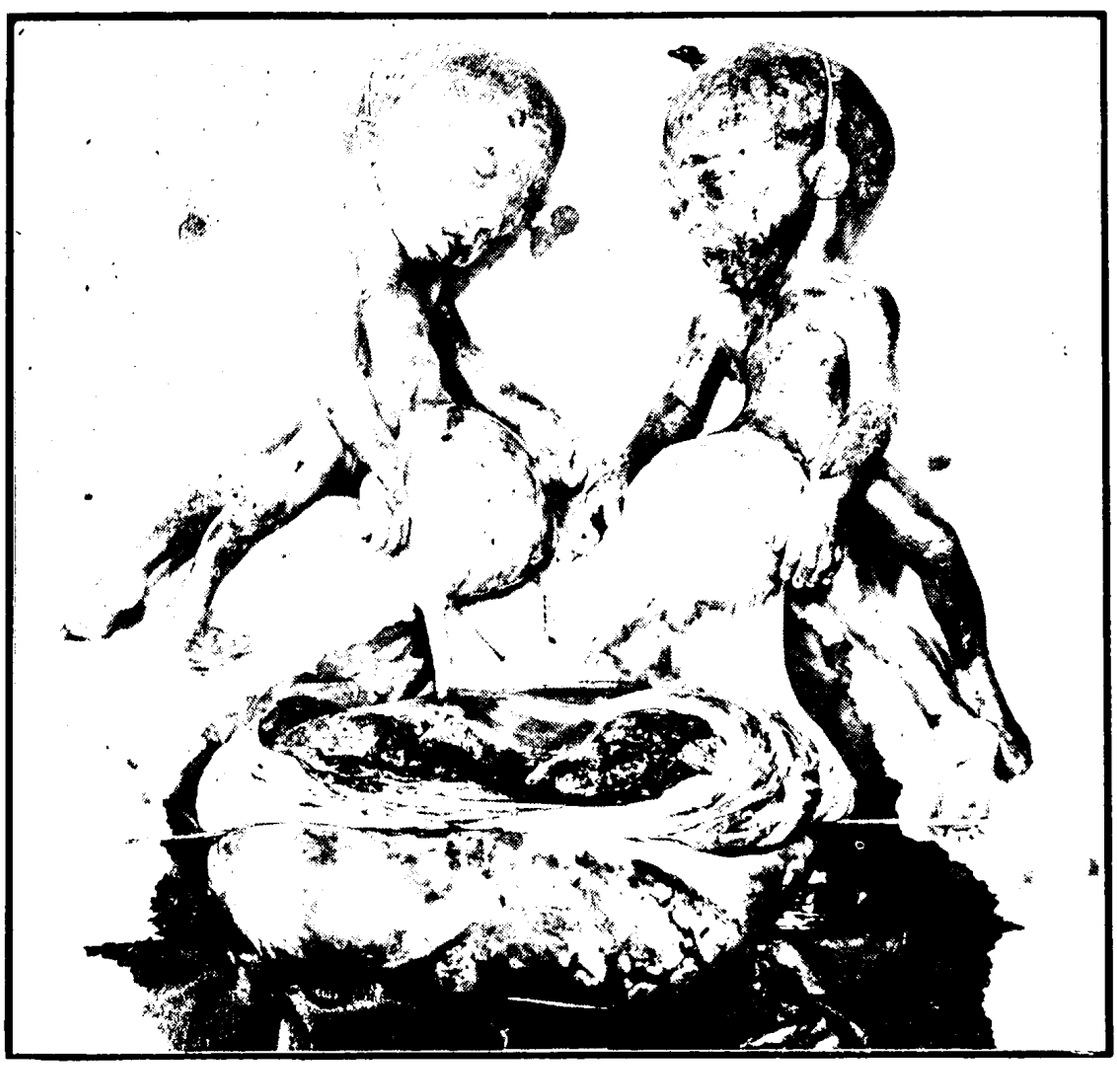


Figure 4. Double Ventral Hernia.

Figure 5. Abdominal Pregnacy.
(Foetus and sac).
Case 1. C.P.S.

This case presented no difficulties from the point of view of the control of beeding.

L.L.Y.—Age 23, married 9 years, no children.

There was a history of amenorrhoea for 1 year, and she complained of pain in the lower abdomen for the last 8 months.

On examination the uterus was found to be displaced to the right by a tumour the size of 7 months pregnancy.

On opening the abdomen the uterus was found to be displaced to the right and somewhat retroposed by a tumour the size of a 7 to 8 months pregnancy. In its lower two-thirds the tumour was entirely free from adhesions, and its surface resembled that of a pregnant uterus. The upper third of the tumour was densely adherent to the omentum, and to coils of intestine (see Figure 6). After the adhesions had been separated, the pedicle was clamped and the tumour removed.

The pedicle consisted of the tube only, (left side), the pregnancy being in the central portion, and when the divided pedicle was inspected, it was found that the outer and inner portions of the tube had been left behind, the former being about ¾ inch long and the latter about 2 inches in length. When the tumour or sac was opened it was found to contain a somewhat macerated foetus, and placenta; the total weight of the tumour was 5 lbs., and the wall about 1/6 inch in thickness.

Had the case gone to full term, as far as one can tell there would have been no very great difficulty in delivering the infant, unless the omentum and intestines had become adherent to the greater part of the surface of the tumour. Haemorrhage from the placental site could have been easily controlled by ligaturing the pedicle of the sac, but the complete removal of the sac itself might have been exceedingly difficult, if not impossible, owing to adhesions, and the difficulty of controlling the bleeding while separating them.

GYNAECOLOGICAL REPORT.

During the year ended 30th April 1932, there were 292 admissions to the gynaecological wards, and 141 operations in addition some 41 patients received radium treatment for carcinoma. Attendances at the gynaecological outpatient department of the Government Civil Hospital numbered 2,230 There were 10 deaths.

The causes of death were as follows:—

1. Tuberculous meningitis.
2. Tetanus.
3. Uraemia (two cases).
4. Carcinoma-advanced (six cases).

Ovarian Cysts.

Operations for removal of ovarian tumours were performed on 20 occasions, there were no deaths. In some cases the tumours were of moderately large size. For example:—

1. L.F.T. age 58—cyst larger than a full term pregnancy, the solid portions of which weighed 5 lbs., and there was in addition 16 pints of fluid.
2. C.Y. age 38—cyst much larger than a full term pregnancy. Estimated weight of the tumour—33 lbs. Fluid content of tumour—20 pints. Tumour becoming malignant. (See Figure 8).
3. C.Y. age 30—Cyst the size of a full term pregnancy. Estimated weight—about 15 lbs.
4. N.K.M. age 29—cyst the size of a full term pregnancy. Fluid content of cyst measured about 18½ pints. Weight of the cyst wall—1 lb.
5. L.M.L. age 20—Dermoid cyst—weight—10 lbs. Free fluid in abdomen.

Ovarian tumours in Asia seem to present a very different problem to those usually seen in the gynaecological clinics in the British Isles, in many cases the patients first seek the advice of native herbalists, and only come to hospital as a last resort. This point has been emphasised by Professor Green Armytage with regard to India, he writes as follows:—

"It is a common error of practitioners in India to consider tumours of the ovary as of small importance and little malignancy, with the result that tumours are allowed to persist until they reach enormous proportions, indeed, proportions which are unbelievable in Europe to-day but which were seen by Lawson Tate and Spencer Wells fifty years ago in Great Britain. The result of such procrastination in India is that patients arrive in hospital often so cachectic that operation is fraught with great anxiety. Moreover, it is frequently found that, as a result of delay, malignancy had occurred in a simple tumour."

For example in the case of patient—No. 2 C.Y. age 38. She had first noticed symptoms 3 years ago. The tumour was a cyst adenoma of the ovary, with areas of malignant degeneration. The complications resulting from neglect of ovarian tumours are of course:—

1. Larger size of the tumours.
2. Adhesions.
3. Contents becoming purulent.
4. Increased frequency of malignant degeneration.

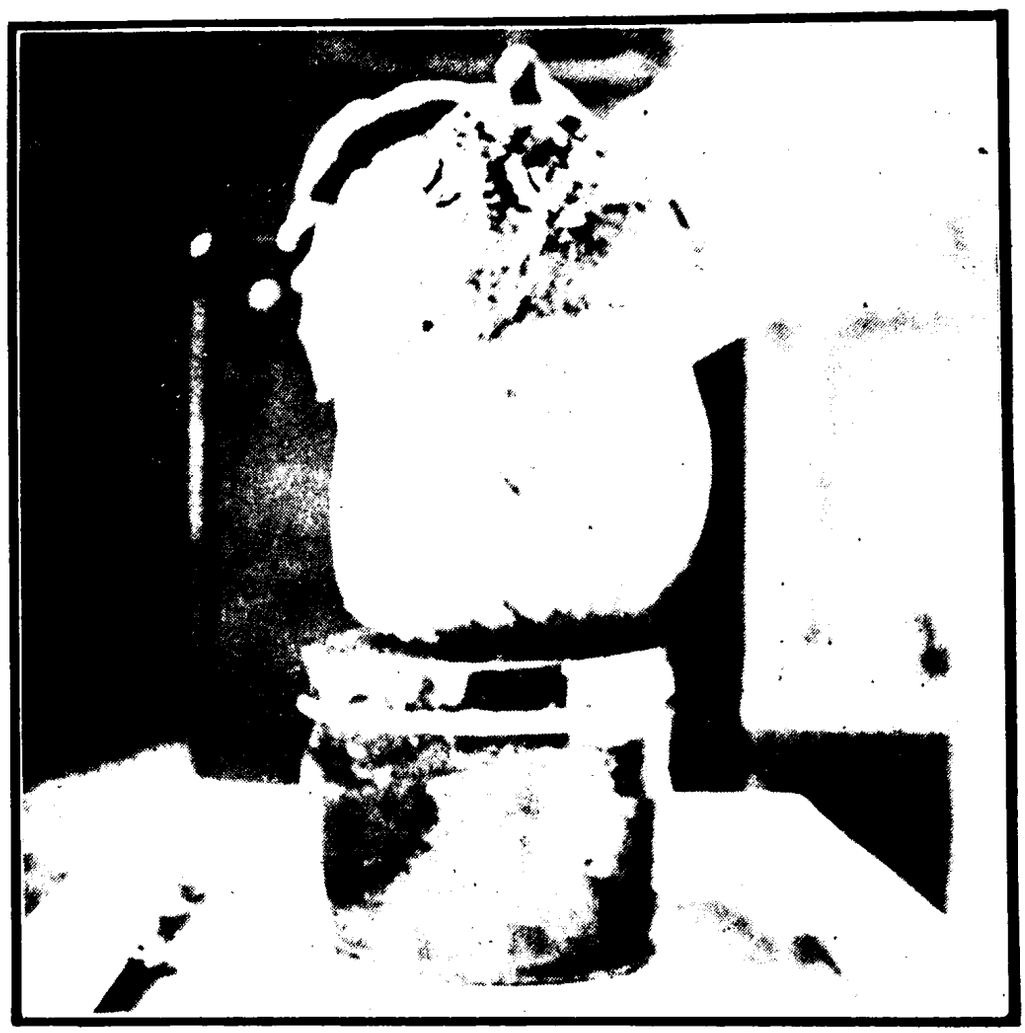


Figure 6. Extra Uterine Pregnancy.
Weight of foetus. 3½ lbs.
Weight of placenta. 1½ lbs.
Case H. L.L.Y

Figure 8. Large Ovarian Cyst.
(Malignant.)
Estimated weight = 32¾ lbs.

One is never anxious to tap a cyst, but these larger tumours are often exceedingly difficult to remove unless their bulk be first reduced in this manner. The cyst is first tapped, and then the cyst wall is drawn out through the wound. In the case of more solid tumours—i.e. Case No. 5 L.M.L. Dermoid cyst. The tumour was removed by first dividing the pedicle, and then delivering the lower pole out through the wound, before the upper.

In our series of 20 cases this year there were two dermoid cysts, one cyst contained 2½ pints of pus, and in one case a very adherent and apparently benign cyst was marsupialised. When the latter procedure is adopted recovery is naturally extremely slow, but in our experience many of the cases ultimately recover.

Hysterectomy.

This operation was performed for myomata on 9 occasions. When the cervix is obviously healthy we perform the sub-total operation, but when the condition of the cervix is doubtful, or definitely, unhealthy, then the entire uterus is removed. As in the case of ovarian cysts, so too we find that myomatous tumours are frequently of very long standing, a point which has to be taken into consideration when operating, as in such cases the patient is often a poor operative risk. We have discussed the question of the mortality rate of hysterectomies with other gynaecologists working elsewhere in Asia, and in many places it would appear that the patients postpone going to hospital as long as possible. Operating continually on such cases, one endeavours to remove the tumour in the simplest manner possible, and therefore there is a tendency for the sub-total operation to be performed (in preference to total hysterectomy) more frequently than perhaps in most European Clinics.

Carcinoma of the Uterus (Cervix and Body).

Forty cases of this condition were treated. We seldom operate on a case now, because it is easier to persuade a patient to come to hospital, if we can promise that there will be no operation, than it is when there is an operation in view. In the case of an ovarian tumour, the patient sees the swelling caused by the cyst, and may realise that something serious is wrong, but in carcinoma the haemorrhage does not frighten her to the same extent, and hence she does not as readily agree to operation.—Secondly, only a small percentage of cases are seen at an early stage.

In treating these cases radium needles are inserted in tandem into the uterus in the usual manner, but for the vaginal application of radium we use our own applicator, which we think has certain advantages. It is true that it does not distend the lateral fornices as much as the colpostat used in Paris, but it is very much easier to insert and remove, the operator is at a greater distance from the radium, and no handling

of the needles is necessary. The instrument (see figure 7) is inserted so that the radium is pushed up into the lateral fornix of one side, all the needles running antero-posteriorly. It is allowed to remain in this position for 12 hours, the instrument is then rotated so that the radium comes to lie in the opposite fornix, and is left there for a similar length of time, and then changed back to its first position.

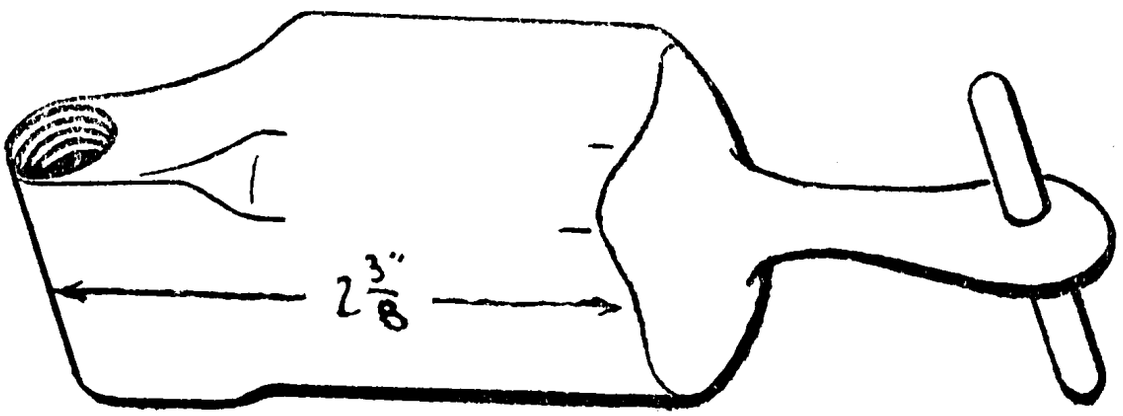


Figure 7. The Author's radium applicator.

The container A. is for the radium needles, which are retained there by pouring in molten paraffin wax.

Note the upper end of the container is threaded in order to grip the wax.

Prolapse and Procidentia.

There were 17 operations performed for this condition, in eleven of which prolapse was complete. It is not uncommon for patients to come up to hospital with a history of complete prolapse of the uterus for five or ten years, and even then they may only come because we have been fortunate enough to cure some friend of theirs. In cases of procidentia we usually operate entirely by the vaginal route, performing vaginal suspension, as described by Cullen, followed by a shortening of the ligaments around the cervix, and colporrhaphy. In one case in which the procidentia was associated with a large cystocele, and a stone in the bladder the size of a golf ball, the stone was crushed and interposition performed, with a view to obtaining the maximum support for the bladder.

In conclusion we wish to thank the Director, and members of the Government Medical Service for their courtesy to us on all occasions; and the Board of Governors of the Matilda Hospital for the occasional loan of some of their radium.

STATISTICS OF MATERNITY DEPARTMENT.

Table No. I.

Nature and number of cases treated :—

	T.Y.H.	*G.C.H.*
Total admissions	1321	606
Total deliveries	1246	563
Multiparae	782	377
Primiparae	464	186
Presentations :—		
Vertex normal rotation	1146	517
Vertex 1	751	320
„ 2	358	185
„ 3	18	7
„ 4	19	5
Vertex face to pubes	16	12
Face	5	1
Breech	39	21
Transverse	4	2
Twins	10	7
Abortions and Miscarriage	22	2
Haemorrhages :—		
Placenta Praevia	11	9
Post Partum	44	37
Accidental	2	3
Abnormalities :—		
Prolapse of cord	—	2
„ „ cervix	1	—
„ „ hand	3	1
Hydramnios	1	5
Eclampsia	1	2
Vesicular Mole	1	—
Albuminuria :—		
Slight to moderate	205	39
Considerable...	6	5
Rupture of uterus	2	1
Operations :—		
Suture of perineal laceration :—		
Complete	—	1
Incomplete	270	134
Multiparae	53	44

Primiparae	217	91
Suture of cervical lacerations	1	14
Forceps	28	20
Destructive operations on foetus	3	1
Bipolar version	7	6
Internal „	4	2
External „	—	1
Manual removal of placenta	8	5
Caesarean section	2	—
Abdominal Pregnancy	1	1

Accidental Complications:—

	T.Y.H.	*G.C.H.*
Lobar pneumonia	1	—
Ascariasis	1	—
Puerperal ulcer	8	1
Septic perineum	—	2
Influenza	—	1
Heart disease	1	—
Asthma	4	—
Dysentery	5	—
Epilepsy	1	—
Albuminuric Retinitis	—	1
Embolism Dyspnoea	—	1
Tuberculosis	—	1
Phthisis	1	—
Gingivitis	1	—
Hook worms and round worms	1	—
Beri-beri	—	1
Bartholin abscess. Gonococcal septicaemia...	—	1
Malaria	1	—
Dengue fever	—	1
Bronchitis	2	1
Rheumatic right wrist joint	—	1
Haemorrhoids	1	—
Small pox	1	—
Boils on lumbar region	1	—

Morbidity, B.M.A. Standard:—

Average, one in	14	13
Percentage	7.15%	7.66%

Mortality:

Total	3	7
Average, one in	415	80
Percentage	.024%	1.22%
Left Hospital Against Advice	203	7

Table No. II.—*INFANT STATISTICS.*

	T.Y.H.	*G.C.H.*
Total Births	1246	563
Alive	1164	536
Dead:	82	27
Premature	10	3
Full term	30	16
Macerated	18	8
Abortions and Miscarriage	23	—
Vesicular Mole	1	—
Abnormalities:—		
Hydrocephalus	2	1
Patent foramen ovale	1	—
Undescended testes	1	—
Anencephalus	2	—
Left hare lip	1	—
Right hare lip and cleft palate	1	—
Cleft palate	—	1
Umbilical hernia	—	1
Complications:—		
Ascites and swelling of eyes	1	—
Ophthalmia Neonatorum	3	2
Transverse left facial paralysis	—	1
Blue asphyxia	2	2
White asphyxia	1	2
Ascites	1	—

Table No. III. *Pelvic Presentation.*

Para	Total	Dead Children	Remarks
T.Y.H.			
Primiparæ.	8	Full Term ... 2	One case prolapse of cervix, foetus shows signs of decomposition. One case with extended legs.
Multiparæ.	31	Macerated ... 3 Premature ... 3 Full Term ... 5	One case hydrocephalus, forceps and manual delivery failed, head perforated at junction of spine and occiput. 3 cases placenta praevia. One case internal version done.
G.C.H.			
Primiparæ.	9	Miscarriage... 1 Full Term ... 2	One case placenta praevia. 3 cases with extended legs.
Multiparæ.	12	Macerated ... 4 Full Term ... 2	One case with footling and extended arms. One death occurred in twin pregancy. Two cases placenta praevia.

Table No. IV.

Placenta Praevia.

Name	Age	Para	Variety	Period of Pregnancy	Presentation	Result to Mother	Result to Child	Treatment & Remarks
T. Y. H.								
C. W. (400)	23	4	Central	30 weeks	Breech	A.	D.	Os admits 2 fingers. Profuse haemorrhage. Pulse 150. Bipolar Version. Submammary saline 2 pints. P.P.H. Uterus and vagina plugged.
W. M. (719)	25	8	Marginal	26 weeks	Transverse	A.	D.	Haemorrhage at 5 a.m. Membranes ruptured at 7 a.m. P.V. 9 a.m. Os size of a dollar. ¼ of the placenta pressing outside os in vagina.
F. W. (745)	32	2	Marginal	Term	Vertex to Breech	A.	D.	Bipolar version. Membranes incomplete. Bipolar Version done. Injection of ½ c.c. pituitrin at 3.10 p.m. Placenta artificially removed.
M. Y. (772)	36	6	Lateral	34 weeks	Vertex	A.	D.	Had haemorrhage before admission. Sent in by a midwife with gauze plug in vagina. Os dilated to 3 fingers. Membranes ruptured Placenta felt laterally situated. Head low down. Contraction good. Pit. ¼ c.c. injected and labour allowed to go on. No haemorrhage.
H. Y. C. (843)	29	1	Lateral	34½ weeks	Vertex Twins	A.	D.	Twins delivery. Profuse haemorrhage on admission. Os scarcely admits 2 fingers: Placenta felt in anterior part of cervical canal. 2 heads are felt presenting. Bipolar version for both foetus.
N. M. C. (853)	36	2	Lateral	34 weeks	Vertex	A.	D.	Admission 2 weeks ago with haemorrhage. Haemorrhage ceased. Lateral placenta praevia —haemorrhage during 2nd stage. Normal delivery live child.

Table No. IV. *Placenta Praevia.—(Continued).*

Name	Age	Para	Variety	Period of Pregnancy	Presentation	Result to Mother	Result to Child	Treatment & Remarks
T. Y. H. W. F. (967)	41	10	Marginal	36 weeks	Vertex	A.	A.	Os admits 2 fingers Vertex presenting at 2.15 a.m. 2 bullet forceps on scalp of foetus and traction with a weight supplied. ¼ c.c. pit. injected ½ hourly 3 times. 7.30 a.m. baby born alive. P.P.H. Uterus and vagina plugged.
W. Y. L. (1272)	42	9	Central	35 weeks	Breech	A.	D.	Had haemorrhage for over 10 days before admission. Patient is collapsed. Breast saline and restorative given. Os admits 2 fingers. Bipolar Version.
W. S. (1312)	45	12	Central	Term	Vertex	A.	D.	Patient under anaesthetic. Bipolar Version. ¼ c.c. Pit. given before delivery after version. 1 c.c. given after delivery for slight P.P.H. Vagina douched and plugged. Tight abdominal binder applied. Digitalin 1 c.c. given.
Y. S. H. (83)	35	10	Marginal	30 weeks	Breech	A.	D.	Foot presenting, which was pulled down. P.P.H. Uterus and vagina plugged.
L. S. S. (342)	27	10	Central	29 weeks	Breech	A.	A.	Following a fall the day before. Internal version. Baby lived for 24 hours.

Table No. IV. *Placenta Prævia.*

Name	Age	Para.	Variety	Period of Pregnancy	Presentation	Result to Mother	Result to Child	Treatment & Remarks
G. C. H. C. K. (7)	28	1	Central	31½ weeks	Breech	A.	D.	4 finger os. Bipolar version. Pituitrin injected.
L. W. S. (187)	30	4	Marginal	28 weeks	Breech	A.	A.	Bipolar Version.
C. W. S. (252)	33	8	Central	29 weeks	Transverse	A.	D.	Profuse haemorrhage. 3 finger os with ½ placenta presenting in vagina with ruptured membranes. Bipolar Version.
H. M. (263)	24	3	Central	36 weeks	Vertex	A.	D.	3 finger os. 2 bullet forceps applied through placenta on to the scalp and slight traction. Pituitrin given. No haemorrhage, normal delivery of child through placenta. Slight P.P.H. difficult 3rd stage.
C. W. S. (291)	35	7	Central	33 weeks	Vertex	A.	D.	2 finger os. Haemorrhage for 12 days before admission. Bipolar version. Saline infusion and treated for shock.
L. H. S. (324)	28	6	Central	29½ weeks	Vertex	A.	D.	Bipolar version done.
Y. K. Y. (362)	30	4	Lateral	30 weeks	Breech	A.	D.	2 finger os, and profuse haemorrhage. External version and foot brought down. ¼ c.c. pituitrin given—no foetal heart sound.

Table No. IV. *Placenta Praevia.—(Continued).*

Name	Age	Para.	Variety	Period of Pregnancy	Presentation	Result to Mother	Result to Child	Treatment & Remarks
G. C. H. C. P. C. (365)	30	4	Lateral	35 weeks	Vertex	A.	A.	Rupture of membranes. Vertex normal delivery with slight antepartum haemorrhage.
L. S. Y. (533)	43	11	Marginal	38 weeks	Breech	A.	A.	3 finger os. Bipolar version. ½ c.c. pituitrin, live infant, normal loss.

Table No. V.

Accidental Haemorrhage.

Name	Age	Para	Period	Variety	Result to Mother	Result to Child	Presentation	Treatment & Remarks
T.Y.H. L. C. (409)	41	10	8 months	Concealed	D.	A.	Vertex 1	Patient was sent in by a Dr. in a collapsed condition, semi-conscious with a very feeble pulse. Os admits a ½ dollar. Breast saline 2 pints. Membranes artifically ruptured. Pit. 1 c.c. Tight abdominal binder. 3 a.m. baby born. Ernutin 1 c.c. given. 5.30 a.m. P.P.H. Breast saline 2 pints. Uterus plugged. Restoratives given. 6 a.m. died.
L. K. (637)	26	2	7½ months	Revealed	A.	A.	Breech 1	Ante-partum haemorrhage. Bleeding 3 days before labour.
G.C.H. (F.) (132)	24	1	Term	Concealed and Revealed	D.	A.	Vertex 1	Rupture of membrane with os size of a dollar. Spontaneous delivery. Slight P.P.H. from a torn cervix, stitched. Normal lochia and puerperium. On 7th morning sudden dyspnoea lung symptoms, patient grow worse and died. Pulmonary embolus.
L. L. S. (276)	41	10	Term	Revealed	A.	A.	Vertex 4	Ante-partum haemorrhage. Artificially rupture of membranes. P.P.H. normal removal, retained chorion. Haemorrhage 7th day membranes removed with flushing spoon.
A. A. T. (378)	37	10	8 months	Concealed and Revealed	D.	D.	Vertex 1	Toxaemia of pregnancy. Strong pains membranes artifically ruptured. Spontaneous delivery. Placenta delivered e large clots size of ½ foetal head. 9 days after had fits. Rotunda treatment improved. But started series of continuous fits and died.

Table No. VI.

Prolapse and Presentation of Cord.

Name	Age	Para.	Weight of Child	Presentation	Treatment	Result to Mother	Result to Child	Remarks
G.C.H.								
N. Y. (105)	35	3	10 lbs.	Vertex presentation. Contracted pelvis, conjugate 3½"	Forceps applied. Large stillborn baby extracted	Alive	Dead	Prolapsed cord with rupture of membrane. Cord not pulsating. Slight atonic P.P.H. Manual removal of Placenta.
S. S. C.								
(315)	38	8	7 lbs. 12 ozs.	Vertex presentation	Normal delivery	Alive	Alive	Prolapse of cord.

Table No. VII.

Application of Forceps.

Indication	Number of Case		Result to Mother				Result to Child				Remarks
			Recovery		Dead		Recovery		Dead		
	T.Y.H.	G.H.C.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y H.	G.C.H.	T.Y.H.	G.C.H.	
Delayed in Second Stage	24	15	24	15	—	—	23	15	1	—	4 cases solid meconium seen. One case pelvic contraction at outlet and large body.
Placenta Praevia	1	1	1	1	—	—	1	—	—	1	Prolapsed cord, ruptured membranes contracted pelvis.
Prolapse of Cord	2	1	2	2	—	—	1	—	1	1	
Eclampsia	1	—	1	1	—	—	1	—	—	—	
Uterine inertia	—	1	—	—	—	—	—	1	—	—	
Face Presentation	—	1	—	—	—	—	—	1	—	—	
Albuminuric Retinitis Pre-eclamptic	—	1	—	—	—	—	—	—	—	1	Face presentation e chin posterior and to the right rotated c kielland forceps.

Table No. VIII.

Number of Pregnancy of Patients in whom Forceps were applied.

PARA.	Number of Forceps Cases.		
	T.Y.H.	*G.C.H.*	*Total.*
1	17	13	30
2	3	1	4
3	3	2	5
4 and over	5	4	9
Total	28	20	48

Table No. IX.

Age of Patients in whom Forceps were applied.

AGE.	Number of Forceps Cases.		
	T.Y.H.	*G.C.H.*	*Total.*
17—25	15	13	28
26—30	5	2	7
31—35	3	3	6
36 and over	5	2	7
Total	28	20	48

Table No. X.

Destructive Operation of the Foetus.

Name	Age	Para	Indication	Operation	Remarks
T. Y. H.					
Y. S. (470)	20	2	Large baby born up to the neck and retained.	After coming head perforated at junction of spine and occiput.	Hydrocephalus. Several attempts at delivery with forceps and manual delivery failed.
C. T. (3)	41	9	Transverse presentation with prolapse of hand. Slight degree of pelvic contraction.	Perforation was done and the brains were flushed out. The head then could be extracted.	Os size of a dollar. Bipolar version. On delivering the foetus the head was caught by the internal os. Anaesthetic was given but still the after coming head was unable to be extracted.
C. T. (118)	31	6	Meconium seen. Presenting part very high. Bandl's ring seen.	Craniotomy.	
G. C. H.					
Y. K. Y. (362)	30	4	Lateral placenta praevia e 2 finger os and profuse haemorrhage. External version and foot brought down. ¼ c.c. pit. given no foetal heart sound.	Head perforated and brain contents washed	Delayed in the after coming head due to constriction of os round neck. No pulsation felt.

Table No. XI.

Morbidity, B.M.A. Standard.

	MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER	
	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.
Total Deliveries..	77	46	84	38	128	55	119	56	104	61	116	63	140	31
Cases Morbid.....	5	4	17	1	10	4	12	4	8	4	4	7	5	1

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		GRAND TOTAL
	T.Y.H.	G.C.H.	T.Y H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	
Total Deliveries..	111	50	111	49	86	34	90	37	79	41	1245	561	1806
Cases Morbid.....	4	4	7	6	4	2	3	3	10	3	89	43	132

	G.C.H.	T.Y.H.	GRAND TOTAL
Total number of morbid cases..	89	43	132
Total average morbidity .. .. 1 in ..	14	13	13.5
Total percentage morbidity	7.15%	7.66%	7.4%

Table No. XII.

Comparative Morbidity in Primiparae and Multiparae.

Primiparae	MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER	
	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.
Total Deliveries..	29	20	31	12	40	20	42	20	33	19	50	15	68	10
Cases Morbid.....	4	3	8	1	5	1	8	2	3	3	3	1	3	—

Primiparae	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		GRAND TOTAL
	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	
Total Deliveries..	37	14	38	21	34	17	35	12	26	6	463	186	649
Cases Morbid.....	1	1	4	5	3	2	1	1	5	—	48	20	68

	T.Y.H.	G.C.H.	GRAND TOTAL
Total number of morbid cases	48	20	68
Total average morbidity .. .. 1 in ..	9.64	9.3	9.47
Total percentage morbidity	10.37%	10.75%	10.48%

Table No. XII.—(*Continued*)

Comparative Morbidity in Primiparae and Multiparae.

Multiparae	MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER	
	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.
Total Deliveries..	48	26	53	26	88	35	77	36	71	42	66	48	72	21
Cases Morbid.....	1	1	9	—	5	3	4	2	5	1	1	6	2	1

Multiparae	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		GRAND TOTAL
	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	
Total Deliveries..	74	36	73	28	52	17	55	25	53	35	782	375	1157
Cases Morbid.....	3	3	3	1	1	—	2	2	5	3	41	23	64

	T.Y.H.	G.C.H.	GRAND TOTAL
Total number of morbid cases	41	23	64
Total average morbidity .. .. 1 in ..	19.07	16.3	17.68
Total percentage morbidity	5.24%	6.13%	5.53%

Table No. XIIIa.

Extra-genital causes of Morbidity.

	T.Y.H.	*G.C.H.*
Puerperal ulcer	6	1
Lobar pneumonia	1	—
Heart disease	1	—
Asthma	1	—
Dysentery	2	—
Septic perineum	—	1
Gingivitis	1	—
Hook worms and round worms	1	—
Beri-beri	—	1
Bartholin abscess, gonoccocal septicaemia	—	1
Malaria	1	—
Rheumatic right wrist joint	—	1
Boils on lumber region	1	—

Table No. XIIIb. *Abdominal Pregnancy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	T.Y.H.						
107	L.L.Y.	25	7-1-33	Extrauterine Pregnancy.	Foetus was contained in the left tube which had apparently enlarged without rupturing. The tube was enlarged to the size of a 7 month pregnancy and was entirely free from adhesions in its lower ⅔, but around the fundus of the tumour the placenta was adherent in the form of a cap. The pedicle was divided first, and then the adhesions were separated without difficulty.	Recovery	The pedicle of tumour was formed by the middle portion of the tube. The distal end of the tube beyond the tumour measured about 2 inches, the proximal end between the uterus and the tumour, measured about ¾ inch. Weight of tumour 5 lbs.
	G.C.H.						
24	C.P.S.	25	24-1-32	Extrauterine pregnancy with spurious labour.	The fresh foetus was covered by a thin sac which was leaking. See was opened and foetus removed. Placenta attached to left tube, and was separated and removed. All bleeding points were tied. Uterus suspended.	Died	Weight of foetus 7½ lbs. Weight of placenta 2½ lbs.

Table No. XIVa.

Caesarean Section.

Name	Age	Para	Nature of Operation	Indication	When Performed	Result to Mother	Result to Child	Remarks	Date
T. Y. H. W. S. T. (1098)	32	2	Extra-peritoneal Caesarean Section	Total length of vagina 2 in. Cervix cannot be felt. Puckered opening of vaginal vault admitting lead pencil. Site of stricture in middle ⅓ of vagina.	During Labour	Alive	Alive	Labour started at 4.30 p.m. Operation at 9.15 p.m.	9-11-31
C. C. (202)	32	4	Lower segment operation.	Contracted pelvis	During Labour	Alive	Alive	Baby had pharyngitis with rash on body. Died on 10-3-32.	28-2-32

Table No. XIVb. *Rupture of Ulterus.*

Name	Age	Para.	Nature of Operation	Indication	When performed	Result to Mother	Result to Child	Remarks	Date
T.Y.H. S. Y. (1277)	33	8	Abdomen opened in midline, foetal head found outside the rent. Rent closed with 2 layers of catgut sutures and abdomen drained.	Uterus ruptured along its entire length from the cervix to the level of the round ligaments on the antero-lateral aspect.	During labour	Recovery	Dead	Face presentation with chin post. Forceps applied before almission. Condition on admission—foetal parts easily felt. Presenting part is high and not fixed. Tear of cervix felt on left side. Vomiting. Blood present in urine.	18-12-31
W. Y. (251)	31	6	A case of twins. 2nd foetus transverse with prolapse of hand. Version done. Uterus was suspected to have torn. Placenta manually removed and uterus explored.	Cervix torn on the right and posteriorly. Profuse haemorrhage.	During labour	Recovery	Alive	Rupture of Uterus brought in by a midwife. A case of twins 1st foetus was delivered by the midwife. delivery. Uterus plugged tear stitched.	16-3-32
G.C.H. W.T.S. (281)	42	7	Uterus plugged and the tear stitched. Internal version delivery. Manual removal of placenta and tear packed.	Ruptured uterus due to neglected. Transverse presentation and placenta praevia.	During labour	Dead	Dead	Died of shock half an hour after	14-10-31

Table No. XV.

Eclampsia.

Name	Admitted	Age	Para	Condition on Admission	Urine	Number of Fits			Treatment	Result to		Remarks	Period of Pregnancy
						Before labour	During labour	After labour		Mother	Child		
T.Y.H. L. K. (854)	11-9-31	23	1	General Oedema	+ +	—	—	11	Morphia 1/6gr. Rectum washed out e Sod. bicarb. solution 4ozs. of mist. alba left in rectum. Rectal washed out again. Morphia 1/6gr. Oil ether 1oz. and paraldehyde zii administered into rectum. Rectal washed out a morphia 1/6gr. Oil ether 1oz. and paraldehyde zii. Oil ether 1 oz. and paraldehyde zii. Very restless. Morphia 1/6gr. Stomach washed out and 4ozs. mist alba run in. Breast saline 20ozs. Hot poultice to loins.	R.	A.	1st fit 50 minutes after forceps delivery. 2nd fit 5 minutes later. 3rd fit 6 hours after. 4th fit 5 days after. 5th fit 9 hours after. 6 hours later 6 fits occurred in close succession.	8m. 20d.
G.C.H. L. Y. (160)	30-7-31	21	1		++	1	—	—	H. I. Morphia gr. 1/6 given stomach washed out and Mist. B.B. given (4ozs.) Colon lavage and Mist. B. B. 6ozs. given.	R.	A.	Patient had a fit for 10 minutes. Normal delivery. Normal lochia.	39½ wweeks
L. K. S. (212)	11-9-31	22	1	Temp. 101.80	-r	1	—	1	H. I. Morphia gr. 1/6 given.	R.	A.	Inflamed vulva. Vaginal discharge. Septic perineum. Offensive lochia. Rigor septic.	39 weeks

Table No. XVI. *Operative Cases showing Morbidity.*

Name of Operation	Number		No. Morbid Cases		Percentage Morbid		Average Morbid		Remarks
	T.Y.H.	G.C.H	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	T.Y.H.	G.C.H.	
Forceps	28	20	8	4	28·5%	20%	1 in 3·5	1 in 5	**T.Y.H.** One case meconium seen. One case had profuse haemorrhage before labour. One case patient has contracted pelvis. Two cases of placenta praevia. **G.C.H.** One case of septic perineum. One case of placenta praevia. One case face presentation e chin posterior and to the right.
Suture of Perineal Laceration.	270	135	36	21	13·3%	15·5%	1 in 7·5	1 in 6·4	
Internal version	4	2	1	—	25%	—	1 in 4	—	Transverse presentation, os near full dilatation, foetal heart beat very slow, membranes artificially ruptured.
Manual removal of placenta	8	5	3	1	37·5%	20%	1 in 2·6	1 in 5	**T.Y.H.** One case adherent placenta, P.P.H. delayed 3rd stage. Two cases uterus in condition of hour glass contraction. **G.C.H.** Retained placenta, removal after 2½ hours.
Placenta praevia	11	9	1	1	9%	11%	1 in 11	1 in 9	**T.Y.H.** Vextex presenting. **G.C.H.** Child delivered through placenta.
Bipolar version	7	6	1	1	14%	16·6%	1 in 7	1 in 6	**T.Y.H.** Had haemorrhage for 10 days admission. **G.C.H.** 2 finger os, haemorrhage for 12 days before admission.
Destructive operation on foetus	3	1	1	—	33·3%	—	1 in 3	—	Craniotomy, presenting part very high, Bandls ring seen.
Induction of labour	2	1	—	1	—	100%	—	1 in 1	

Table No. XVII.

Duration of Stay in Hospital of Morbid Cases.

		T.Y.H.				G.C.H.
Less than 10 days	69	cases	including	1	death.	30 cases.
10 to 19 days	19	,,	,,	—	,,	9 ,,
20 to 29 days	1	,,	,,	—	,,	3 ,,
Over 20 days	—	,,	,,	—	,,	1 ,,
Total	89	,,	,,	1	,,	43 ,,

Table No. XVIII.

Duration of Temperature.

		T.Y.H.				G.C.H.
Less than 5 days	74	cases	including	1	death.	39 cases.
5 to 9 days	14	,,	,,	—	,,	2 ,,
10 to 19 days	1	,,	,,	—	,,	1 ,,
Over 19 days	—	,,	,,	—	,,	1 ,,
Total	89			—		43 ,,

Table No. XVIX.

Highest Temperature Charted.

		T.Y.H.				G.C.H.
100 to 100.9	26	cases	including	0	death.	14 cases.
101 to 101.9	32	,,	,,	,,	,,	16 ,,
102 to 102.9	15	,,	,,	,,	,,	8 ,,
103 to 103.9	11	,,	,,	,,	,,	2 ,,
104 and over	5	,,	,,	1	,,	3 ,,
Total	89	,,	,,	1	,,	43 ,,

Table No. XX. *Mortality.*

Name	Age	Para	Admitted	Delivered	Died	Cause of Death	Remarks
T.Y.H. L. C. (409)	41	10	7-5-31	7-5-31	7-5-31	Concealed Accidental Haemorrhage. Post Partum	Sent in by a Dr. is a collapsed condition. Semi-conscious,, very feeble pulse. Os admits a ½ dollar. Breast saline 2 pints. Membranes artificially ruptured Pit. 1 c.c. Tight abdominal binder 5.30 a.m. P.P.H. Breast saline 2 pints uterus plugged. Restoratives given. 6 a.m. died.
L. M. (767)	47	11	20-8-31	21-8-31	21-8-31	Beri-beri.	On admission the heart was rapid a tick-tack in character. Os admits 3 fingers after digitalin injection. Membranes artificially ruptured, ¼ c.c. pit. injected to hasten labour. After delivery patient seemed active, general condition good. Sudden complaint of giddiness and collapse. Artificial respiration failed. Placenta extracted bimanually.
(L.Y.P.) (1123)	33	1	11-11-31	11-11-21	15-11-31	Puerperal septicaemia	Patient was a prostitute. Puerperal ulcer dusted with iodoform powder. On exam. a myoma size of a citron was felt. 15-11-31 at 4 a.m. pulse become weak and respiration becomes more rapid. 1 c.c. camphor injected. At 5 a.m. diel.
G.C.H. C..P.S.	25	2	22-1-32	24-1-32	27-1-32	Extra uterine pregnancy with spurious labour.	The fresh foetus was covered with a thin sac which was leaking. Sac opened a foetus removed. Placenta attached to left tube, and was separated and removed. All bleeding points were tied. Uterus suspended.

Table No. XX.—*(Continued)* *Mortality.*

Name	Age	Para	Admitted	Delivered	Died	Cause of Death	Remarks
G.C.H. F. (132)	24	1	23-7-31	24-7-31	31-7-31	Failing heart myocarditis. Acute oedema of lungs.	Rupture of membrane with os size of a dollar. Spontaneous delivery with Concealed and Revealed haemorrhage. On the 7th morning sudden dyspnoea with lung symptoms rales over both lungs, pulse irregular and weak. Patient grew steadily worse and died 15 hours after onset.
W. T. S. (281)	42	7	14-10-31	14-10-31	14-10-31	Died of shock ½ hour after delivery. Ruptured uterus.	Ruptured uterus due to neglected transverse presentation and placenta praevia. Intersal version.
L. K. S. (284)	20	1	13-10-31	17-10-31	18-10-31	Pulmonary embolism	Admitted with dengue fever. Normal delivery. Slight Ante-partum haemorrhage during late 2nd stage. Morning after delivery suddenly got worse at 11.30 a.m. and died at 12.40 p.m. signs of air hunger.
C. O. K. (312)	18	1	29-10-31	29-10-31	7-11-31	Acute cystitis	Normal twin delivery. 5th day rigor. 8th day pus and bacilli in urine. Died on 9th day normal lochia.
A. A. T. (378)	37	10	17-12-31	17-12-31	26-12-31	Uraemia	Spontaneous delivery. 9 days after had fits. 26-12-31 started series of continuous fits. Died at 6 p.m. without regaining consciousness.
C. Y. M. (535)	23	2	10-4-32	10-4-32	11-4-32	Meningitis	Next morning after delivery patient is restless and semi-conscious. Corneal opacity developed on left eye. Pain in joints and back. 1 p.m. Haustus Sed. zi given& 5 p.m. morphia gr. 1/6 given. 6 p.m. unconscious. Dilated pupils. Cheyne Stokes breathing. Pulse 110 good tension. 6.15 p.m. died.

Table No. XXI.

Induction of Labour With Stomach Tube.

	T.Y.H.	*G.C.H.*
Number of cases successful	2	1
Total number of cases	2	—

Table No. XXII.

Duration of Stay in Hospital.

	T.Y.H.	*G.C.H.*
Total number	1245	562
Less thon 3 days	3	2
From 3 to 5 days	10	2
From 6 to 8 days	1093	509
From 9 or more days	139	49

STATISTICS OF GYNAECOLOGICAL DEPARTMENT.

Table No. I.

	T.Y.H.	*G.C.H.*
Number of admissions	147	118
Number of operations	71	70

Table No. II.

Nature and Number of Operations.

	T.Y.H.	*G.C.H.*
Vulva :—		
Chronic labial abscess	—	1
Perineum :—		
Perinaeorrhaphy	1	—
Urethra :—		
Plastic operation	1	—
Caruncle, excision of	—	1
Vagina :—		
Implantation cyst of	—	1
Stricture of vagina	—	1
Vesico-Vaginal fistula	1	—
Anterior Colporrhaphy	1	—
Cyst of	1	—
Uterus :—		
Curettage	26	14
Currettage and insertion of pessary	—	2
Prolapse	3	14
Ventro-suspension (abdominal)	1	2
Hysterectomy (subtotal)	5	4
Hysterectomy (total)	1	—
Myomectomy	4	2
Alexander-Adam's	1	—
Cervix :—		
Stricture of	—	1
Trachelorrhaphy	2	1
Amputation	3	—
Polypus, removal of	1	1
Laceration of	—	1
Tubes and Ovaries :—		
Ovariotomy	5	9
Salpingectomy	1	5

Salpingostomy	—	1
Chocolate cyst	1	—
Dermoid cyst	1	—
Extra uterine gestation	4	—
Broad Ligament Cyst	2	2
Salpingo-oophrectomy	1	—
Miscellaneous :—		
Emptying of uterus for pernicious vomiting	1	—
Exploratory Laparotomy	1	—
Ascites	—	1
Breast abscess	1	—
Incision of abscess	1	—
Testing patency of tubes	—	1
Placental polypus	—	1

Table No. III.

Nature and Number of Cases Treated Without Operation.

	T.Y.H.	*G.C.H.*
Refused operation	31	2
Pregnancy with abdominal pain	1	—
,, ,, pneumonia	1	—
,, ,, haemorrhage	1	—
,, ,, cough	1	—
,, ,, oedema	1	—
,, ,, asthma	—	1
,, ,, leucorrhoea	1	—
Gonococcal Vulvitis	—	1
Infantile Uterus	2	—
,, ,, with leucorrhoea	2	—
Subinvolution	—	2
Carcinoma of cervix (radium treatment)	30	9
Keloid treated with radium	1	—
Carcinoma of breast	—	1
Carcinoma of body of uterus	—	1
Threatened abortion	—	1
Complete abortion	1	1
Incomplete septic abortion	—	1
Puerperal Sepsis	—	1
Pyosalpinx	—	1
Retroversion (pessary)	3	2
Retroversion and salpingitis	4	3
Salpingitis	9	7
Chronic mastitis	—	2
Mastitis	—	2

Acute gonorrhoea	6	1
Cystitis with uraemia	1	—
Vesical calculus	2	—
Dysmenorrhoea	1	—
Ischial rectal abscess	1	—
Hypertrophy of vulva	1	—
Metrorrhagia	1	—
Irregular menstruation	1	—
Cervicitis	—	1
Gumma of pubis	—	1
Tetanus	—	1
Hyperemesis Gravidarum	—	1
Menorrhagia	—	1
Tuberculous Meningitis	—	1
Tuberculosis	—	1

Table No. IV. *Hysterectomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	T.Y.H.						
282	F. L.	51	12-5-31	Myoma. Cervical polypus.	Supra-vaginal hystereetomy. Left Salpingectomy. Right ovariotomy.	Recovery.	Haemato salpinx left side, uterus size of flat, small cyst of right ovary. Numerous adhesions rendered the raising up of the uterus, somewhat difficult. Hard, small polypus size of a hazel nut.
295	M. C. K.	48	7-6-31	Myoma.	Subtotal hysterectomy.	Recovery.	Abdomen occupied by a swelling size of 6 months pregnancy, apparently connected with uterus. Swelling is hard. Weight of tumour 3¼ lbs.
60	W. K.	45	1-10-31	Myoma.	Subtotal hystereetomy.	Recovery.	Abdomen occupied by a tumour size of 7 months pregnancy. Weight of tumour 5 lbs.
84	L. Y.	48	5-11-31	Myoma.	Subtotal hysteree tomy. Double oöpherectomy.	Recovery.	Uterus enlarged to size of 6 months pregnancy. Swelling is hard. Uniform growth. No adhesions. Weight of tumour 4 lbs.
105	C. Y. K.	34	7-1-32	Pre-malignant uterus.	Total hysterectomy.	Recovery.	Uterus enlarged and retroverted. Cervix is hypertrophied anl bleeds easily. Premaligiant stage.
140	F. S.	44	24-3-32	Myoma.	Subtotal hysterectomy.	Recovery.	Uterus about the size of an American orange and hard. Both ovaries and tubes are removed during separation of adhesions.

Table No. IV.—*(Continued)* *Hysterectomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	G.C.H.						
239	C. H.	48	12-5-31	Uterine fibroid.	Subtotal hysterectomy.	Recovery.	Tumour size of a football, adherent on the right to abdominal wall. Transverse colon and omentum adherent to superior aspect of tumour. Weight 6¼ lbs.
280	L. Y.	41	11-9-31	Fibroid of uterus.	Subtotal hysterectomy.	Recovery.	Uniform enlargement of uterus, size of 5 months pregnancy.
284	K. S.	47	29-9-31	Uterine fibroid.	Subtotal hysterectomy.	Recovery.	Enlargement of uterus to size of a 6 months pregnancy, freely movable over pelvic brim. Tumour occupied the posterior aspect of body of uterus. Left ovary is loosely adherent to tumour. Some cysts of Morgagni are removed from right side. Tumour and uterus removed weigh 2¾ lbs.
285	F. N. M.	49	6-10-31	Uterine fibroid.	Subtotal hysterectomy.	Recovery.	Cervix displaced upwards and forwards. Irregular enlargement of uterus move on right side. Multiple fibroids felt about the size of foetal head.

Table No. V. *Ovariotomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	T.Y.H.						
31	L. Y. Y.	47	6-8-31	Left chocolate cyst.	Ovariotomy.	Recovery.	Cyst size of an orange.
50	D. M.	27	10-9-31	Broad ligament cysts.	Left broad ligament cyst shelled out. Left cystic ovary excised.	Recovery.	Ruptured during shelling out. Cyst size of a foetal head.
85*	L. F. T.	58	5-11-31	Very large multilocular ovarian cyst.	Ovariotomy.	Recovery.	Cyst size of 11 months pregnancy. Free fluid in abdomen, slight adhesion. Weight of cyst 5 lbs. Fluid 16 pints.
87	C. C. S.	47	19-11-31	Ovarian cyst.	Ovariotomy.	Recovery.	Uterus retroverted and displaced to the right by a tumour size of 6 months pregnancy. Weight of cyst 2½ lbs. Left ovary contains a raised haemorrhagic area suggestive of a chocolate cyst.
118	I. I. S.	39	25-2-32	Broad ligament.	Both cysts shelled out.	Recovery.	Left cyst size of a pine apple. Right cyst size of an orange. Right tube and ovary removed with the cyst.
130	L. K.	46	5-3-32	Ovarian dermoid.	Marsupialisation of adherent cyst.	Recovery.	Uterus anteposed to a tumour size of pumelo. On tapping the cyst, sabaceous material escaped. Contents appeared septic. Cyst was brought to abdominal wall and marsupialised.

Table No. V.—*(Continued)* *Ovariotomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	T.Y.H.						
57*	H. W. F.	31	22-9-31	Ovarian cyst.	Ovariotomy. Left oöpherectomy done.	Recovery.	Abdomen occupied by a swelling size of 7 months pregnancy. Right ovarian cyst tapped and removed. Small chocolate cyst of left ovary incised. Weight of cyst ½ lb. Fuid 6: 1102.
144	C. Y.	38	7-4-32	Ovarian cyst.	Ovariotomy.	Recovery.	Abdomen occupied by a tumour size of 14 months pregnancy. Tumour very tense with a raised solid area in front size of a walnut. Another solid area on right side. Otherwise tumour is cystic. An area of redness around umbilicus. Numerous adhesions. Amount of fluid tapped measured 20 pints. Weight 23½ lbs. Cyst wall and r sidual fluid weighed 9½ lb.
149	W. Y. Y.	29	14-4-32	Ovarian cyst.	Ovariotomy.	Recovery.	Cyst size of 7 months pregnancy. One loculus of cyst ruptured prior to operation. When peritoneum opened free cyst fluid escaped. Weight of tumour 3½ lbs. Amount of fluid 4 pints.
	G.C.H.						
245	C. Y.	39	2-6-31	Right ovarian cyst.	Ovariotomy.	Recovery.	Tumour size of full term pregnancy. Cyst tapped, coffee colour fluid and sago-like lumps size of a shot to size of a pea partially filled the cavity of the sac. Weight of solid tumour 2 lbs. Weight of fluid content 13 lbs.

Table No. V.—*(Continued)* *Ovariotomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	G.C.H.						
17	W. K.	32	22-12-31	Right ovarian cyst.	Double ovariotomy.	Recovery.	Tumour size of 6 months pregnancy springing from right side. Tumour adherent and pedicle twisted. Left side a hen's egg. Stumps suspended to peritoneum and uterus ventrally suspended.
31	T. K.	33	23-2-32	Small cystic ovary. Fixed retroverted uterus.	Adhesions separated. Partial excision of cystic ovary.	Recovery.	Uterus adherent to pouch of Douglas Right cystic ovary, size of an egg. Tubes thickened and blocked. Uterus suspended by round ligaments and fundus of uterus.
31	N. T. S.	31	8-3-32	Cystic ovary and Pyosalpinx.	Ovary and tube of left side excised. Hæmatoma of rt. ovary incised and sutured.	Recovery.	Cystic ovary on left side size of a golf ball and pyosalpinx. Separation of cyst and pyosalpinx from Douglas pouch. Both tube and cyst ruptured. Pus issued into the wound.
46	C. K.	46	15-3-32	Ovarian cyst undergoing suppuration.	Ovariotomy.	Recovery.	Uterus enlarged, displaced upwards and forwards by a cystic tumour size of a small football, occupying part of Douglas pouch and lower abdomen. Cyst tapped, offensive pus 2½ pints evacuated. Cyst firmly adherent and unable to be separated. Sac drained to Douglas pouch, pouch drained through posterior fornix. Cyst drained e rubber tubing through abdomen.
45	L. M. L.	20	5-4-32	Ovarian cyst partly cystic partly solid. Dermoid.	Ovariotomy.	Recovery.	Cyst size of 9 months pregnancy. Pedicle divided first and lower pole extracted. Tumour coming from left side. Right ovary cystic size of walnut. Cyst resected, on account of patients age, a small portion of base of ovary left behind. Cyst weighed 10 lbs. Free fluid in abdomen, slight adhesion. A typical dermoid. Tumour contained hair, sebaceous material and particles of bone.

Table No. V.—*(Continued)* *Ovariotomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
	G.C.H.						
246	N. K. M.	29	2-6-31	Ovarian cyst.	Ovariotomy.	Recovery.	Uterus anteposed by a cystic tumour size of a full term pregnancy. Tumour bulges in the posterior fornix. Cyst adherent to omentum in several places. Cyst tapped and removed. Amount of fluid inside cyst 18½ pints. Weight of solid part (capsule) of cyst 1 lb.
248	C. A. S.	66	16-6-31	Broad ligament cyst. Malignant.	Adresion to intestine. Cyst was shelled out.	Recovery.	Upper portion of cyst was malignant and adherent to transverse colon. Appendix and signed colon. Fluid content chocolate brown in colour 3 pints and 1 oz. Cyst and remaining fluid weighed 1 lb.
254	L. K.	15	7-7-31	Ovarian cyst. Dermoid.	Ovariotomy.	Recovery.	Cystic swellings in left iliac region, and right side of abdomen. Cyst tapped, dark brown fluid evacuated (6 pints). Partial collapsed cyst (2¾ lbs.) Right pedicle clamped and cyst excised. Cyst contained hair, cartilage and sebaceous matter.
272	L. S. M.	29	31-8-31	Ovarian cyst.	Ovariotomy.	Recovery.	Multilocular cyst size of a full term pregnancy. Cyst tapped mucous fluid evacuated. Weight of tumour 3¼ lbs. Quantity of fluid 120 oz.
300	H. W. S.	42	17-11-31	Right broad ligament cyst.	Cyst shelled out. Right salpingectomy done Douglas pouch drained through posterior vaginal fornix.	Recovery.	Cyst size of foetal head. Weight of tumour 6 oz. Weight of fluid 38 ozs.

Table No. VI. *Salpingectomy and Oopherectomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
281	**T.Y.H.** W. W.	27	14-5-31	Uterus retroverted and drawn some what to the right.	Double salpingectomy and double oopherectomy.	Recovered.	
19	C. K.	20	17-7-31	A lump on left side size of an egg. Some exudate in post fornix.	Left tube easily excised. Both tubes unhealthy. Cyst punctured and sewn over. One suspension stitch.	Recovered.	Omentum adherent to fundus of uterus and tubes. Both tubes enlarged to size of hen's egg.
65	K. S.	20	8-10-31	Uterus retroverted, apparently not fixed.	Small cyst of left ovary resected. Suspension sutures.	Recovered.	No adhesions. Both tubes appear to be patent as far as isthmus.
256	**G.C.H.** S. F.	25	7-7-31	Fixed retroverted uterus. Chronic salpingitis.	Double salpingostomy uterus suspended. Left ovary incised, a corpus luteum cyst enucleated. Ovary sewed.	Recovered.	Uterus adherent to pouch of Douglas, omentum also adherent.
257	S. A. T.	27	7-7-31	Small retroverted uterus, cystocele and rectocele. Subacute salpingitis.	Application of tampons. Tubes patent.	Recovered.	Uterus slightly adherent to pouch of Douglas.
265	L. K. Y.	21	25-8-31	Retroverted uterus and tear of perineum.	Abdominal ventral suspension and perineorrhaphy.	Recovered.	
12	H. K.	29	15-12-31	Retroversion.	Adhesions freed. Both tubes blocked. Left distended tube incised and stitched. Partial resection of left ovary.	Recovered.	Uterus bound down by adhesions all round. Round ligaments brought through peritoneum and rectus sheath and stitched together with square stitches.

Table No. VI.—*(Continued)* *Salpingectomy and Oopherectomy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
14	**G.C.H.** M I. K.	34	15-12-31	Fixed retroversion.	Left tube ligatured and cut. Right tube patent. Both broad ligaments lifted up and served to peritoneum at the round ligaments. Uterus ventrally suspended.	Recovered.	Adhesions broken down.
20	Y. H.	28	5-11-32	Fixed retroversion.	Right salpingectomy. Adhesions freed.	Recovered.	Omentum adherent to uterus. Right tube distended to size of an orange (Pyosalpinx). Left tube thickened.
47	K. H.	21	5-4-32	Subacute salpingitis.	Laparotomy. Adhesions freed. Omentum and intestine separated. ight thickened tube resected. Uterus ventrally suspended.	Recovered.	
52	T. Y. N.	25	12-4-32	Fixed retroversion.	Adhesions freed. Uterus ventrally suspended.	Recovered.	Both tubes inflated with a bladder syringe and were found blocked.

Table No. VII. *Extrauterine Pregnancy.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
33	**T.Y.H.** L. M.	30	11-8-31	Extrauterine gestation.	Operation for extrauterine pregnancy.	Recovered.	Pain in abdomen for 9 days. Haemorrhage for 3 days.
62	C. K.	28	1-10 31	Left old-ruptured extrauterine pregnancy.	The tumour was found to be a sac containing the extrauterine pregnancy. Sac was incised, clots turned out cavity plugged with gauze, drained through vagina, roof of sac oversewn.	Recovered.	Uterus is found to be anteposed to a large swelling occupying the Douglas pouch. The omentum is adherent to the fundus of uterus and covered over the swelling.
134	F. S. M.	28	24-3-32	Extrauterine pregnancy.	Operation for extrauterine pregnancy. Swelling densely adherent.	Recovered.	Uterus enlarged to size of a tennis ball. On the left cornu there is a projection. Weight 1½ lbs.
143	C. S.	32	2-4-32	Tubal pregnancy.		Recovered.	Swelling on right side of abdomen size of 5 months pregnancy. Uterus felt separate from tumour.

Table No. VIII. *Prolapse.*

No.	Name	Date	Age	Disease	Operation	Result
53	**T.Y.H.** T. N. N.	15-9-31	27	Slight clescant of uterus, cystocele. Torn perineum.	Perincorrhaphy. Anterior colporrhaphy. Amputation of cervix.	Recovery.
113	P. H. L.	16-2-32	38	Uterus retroverted. Probably replaceabe. Prolapse 2nd degree. Erosion of cervix. Old tear of perineum.	Anterior colporrhaphy. Supra-vaginal amputation of cervix. Perincorrhaphy and ventral suspension. On opening abdomen free blood appeared apparently coming from region of bladder veins. Uterine artery was tied on left side, and gauze plug applied to bladder. Uterus suspended.	Recovery.
123	C. T. T.	3-3-32	31	Uterus retroverted. Prolapse 2nd degree. Cystocele and rectocede. Old tear of perineum.	Ventral suspension. Shortening of ligaments. Anterior colporrhaphy. Amputation of cervix. Perineorrhaphy.	Recovery.
244	**G.C.H.** W. O.	2-6-21	37	Complete prolapse c ulceration of cervix.	Complete prolapse operation with ventral suspension and Colpo-perinaeorrhaphy.	Recovery.
247	L. H.	16-6-31	37	Procidentia.	Colpo-perinaeorrhaphy. Complete prolapse operation. Vaginal interposition. Perinaeorrhaphy.	Recovery.
262	S. H.	3-7-31	50	Procidentia. Cystocele.	Complete prolapse operation. Vaginal ventral suspension.	Recovery.
276	T. K.	8-9-31	33	Complete prolapse of uterus.	Complete prolapse operation. No vaginal ventral suspension done owing to adhesion of bladder to uterus. Perineorrhaphy done.	Recovery.

Table No. VIII.—*(Continued)*

Prolapse.

No.	Name	Date	Age	Disease	Operation	Result
282	G.C.H. H. N.	22-9-31	28	Procidentia.	Complete prolapse operation and rectal ether given.	Recovery.
288	W. P. L.	13-10-31	23	Lacerated cervix Retroversion. First degree prolapse. Retroverted uterus.	Cervix ampulated. Anterior colporrhaphy. Tumour, size of a ping pong ball felt. Tumour found in interstitial part of right tube. Tumour resected. Uterus suspended.	Recovery.
291	W. L. S.	51-1-31	42	Rectocele and Cystocele.	Anterior colporrhaphy. Shortening of Mackenrodt's ligaments. Posterior colporrhaphy. Uterus well in front.	Recovery.
297	W. S.	10-11-31	35	Prolapse of uterus.	Complete prolapse operation.	Recovery.
298	W. S.	3-11-31	28	Prolapse of uterus.	Rectal ether 1½ oz. Complete prolapse operation.	Recovery.
1	C. Y.	24-11-31	47	Procidentia.	Complete prolapse operation. An implantation cyst in anterior vaginal wall also excised.	Recovery.
3	W. L. S.	26-11-31	42	Roctocele and cystocele.	Prolapse operation done.	Recovery.
5	C. W. S.	3-11-31	28	Prolapse of uterus.	Complete prolapse operation.	Recovery.
7	C. G.	1-12-31	37		Complete prolapse operation.	Recovery.
54	L. N. H.	14-4-31	27	Prolapse of uterus (congenital).	Complete prolapse operation anl vaginal ventro-suspension.	Recovery.

Table No. IX. *Miscellaneous Operations.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
276	**T.Y.H.** F. N. M.	25	7-5-31	Tear of urethral orifice.		Recovery.	
288	N. Y. S.	47	28-5-31	Myoma.	Protruding part of tumour was ligatured and removed, drainage tubes inserted. Remaining part which attached to fundus was removed by a process of morcelation.	Recovery.	Swelling protruding from vulva. Much foul discharge in vagina. Weight of tumour 1¾ lbs.
289	C. A. S.	50	28-5-31	Pedunculated myoma.	Removed by a process of morcelation.	Recovery.	Tumour size of a cocoa-nut. Weight of tumour 1½ lbs.
14	C. T. Y.	34	7-7-31	Fibroids.	Raw surface of uterus sewn over. One suspension stitch inserted to sup. and ant. aspect of uterus.	Recovery.	Uterus enlarged with several fibroids varying from size of a pea to size of golf ball. 7 in. number, all nucleated.
95	T. C. C.	28	17-12-31	Vesico-vaginal fistula.	Bladder separated from anterior cervical wall, and brought to the front so as to form a new urethral wall. Vaginal mucous membrane united.	Recovery.	Entire urethra torn away except ¼ inch of the lower end. Lower part of bladder communicating with vagina.
99	Y. P.	49	17-12-31	Myoma.	Vaginal myomectomy.	Recovery.	Tumour size of mandarin orange attached to cervix. Weight of tumour 8 ounces.

Table No. IX.—*(Continued)* *Miscellaneous Operations.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
148	**T.Y.H.** L. M.	26	14-4-32	Uterus deflected to the left by a stony hard growth size of an apple.	Laparotomy.	Recovery.	Pelvis was found to. be occupied by a large mass to which rectum, left tube and ovary, and omentum were adherent. Omentum and intestine roofed over the mass in front. On separating the adhesions the mass was found to consist of indurated tissue in the meso rectum adherent to the left ovary which could not be exposed to view. No attempt was made to remove the growth.
242	**G.C.H.** H. H.	45	26-5-31	Broad ligament myoma.	Tumour growing from left broad ligament shelled out e difficulty and tumour removed. Raw surface of left side of uterus near fundus and broad ligament sewn over. One suspension stitch.	Recovery.	Tumour size of full term pregnancy. Transverse colon and omentum were adherent to upper part of tumour. Weight of tumour 8½ lbs.
249	A. Y. C.	50	23-6-31	Cervical polypus.	Growth removed by twisting.	Recovery.	Polypus size of a thumb projecting from vagina. Growth is found to spring from cervix.
250	L. Y.	30	26-3-31	Urethral caruncle and cystocele.	Heart shaped incision made around growth tumour removed. Rent stitched. Vagina plugged.	Recovery.	Swelling about the size of a pea.

Table No. IX.—*(Continued)* *Miscellaneous Operations.*

No.	Name	Age	Date	Disease	Operation	Result	Remarks
253	**G.C.H.** S. K.	31	31-6-31			Recovery.	Myoma removed, size of a sunkist orange.
259	L. S. Y.	34	14-7-31	Placental polypus.	Tumour shelled out, and uterus flushed c a blunt flushing curette.	Recovery.	Tumour size of a walnut.
267	S. Y.	25	18-8-31	Implantation cyst.	Cyst disserted out.	Recovery.	Cystic swelling on posterior vaginal wall.
290	L. Y.	20	21-10.31	Laceration of cervix and retroversion	Emmets trachelor rhaphy. D. and C. Replacement of uterus by Smith Hodge pessary.	Recovery.	Cervix transversely torn. Soft and bluish. Uterus retroverted, tender on examination.

SOME NOTES ON THE ANATOMY AND SURGERY OF FIBROUS TISSUE.

Kenelm H. Digby.

INTRODUCTION.

In the human body the tough material known as white fibrous tissue occurs in the form of:—

1. *tendons and aponeuroses* serving as the attachments of muscles,
2. *fasciae,* forming the envelopment of muscles,
3. *ligaments,* which bind the bones together in joints; or which strengthen tendon sheaths,
4. *fibrous linings of compartments,* such as the fibrous layers of dura mater, pericardium, pleura, periosteum.
5. Fibrous layer of the skin (corium) and of the mucous membranes (submucosa).

It is with the first two of these namely tendons and fasciae that this paper will deal.

TENDONS.

Tendons arise in association with the development of long limbs containing bones acting as levers so that the range of movement of the point of insertion is slight compared with the distance from the origin to the insertion of the muscle.

When a muscle contracts it undergoes considerable shortening. We can form some estimate of the degree of shortening by measuring the varying distance between origin and insertion of any muscle which consits of parallel fibres the whole distance with no tendons at their origin or insertion. Such muscles are the clavicular part of the sterno mastoid, the sartorius, the rectus abdominis, the gluteus maximus and the pectoralis major.

For instance, in one individual when the head was extended, and rotated so that the face looked to the right and the neck was lateri-flexed to the left side, the right sternomastoid was stretched and was found to measure six inches, whilst the left sternomastoid in the same individual was contracted measuring four inches.

It is safe to say then, that a muscle in contracting shortens by one-third at least.

Probably when its tendon is divided, a muscle is capable of contracting a little more in length than when it is contracting against a load or against its antagonist.

If we know how much a muscle contracts and know the length and arrangement of fibres in the particular muscle, we can form an idea how far the proximal end can have retracted along its sheath when a tendon is divided.

Assuming now that a muscle fibre shortens by one-third in passing from a stretched to a contracted condition, then where the distance between origin and insertion of the muscle into the skeleton varies from the maximum to two-thirds of the maximum, the best mechanical advantage will be obtained by parallel fibres passing the whole way straight from origin to insertion.

Very often, however, the range of variation in the distance from origin to insertion is much less than one-third. Thus with the palmaris longus in one instance the origin-to-insertion distance varied from

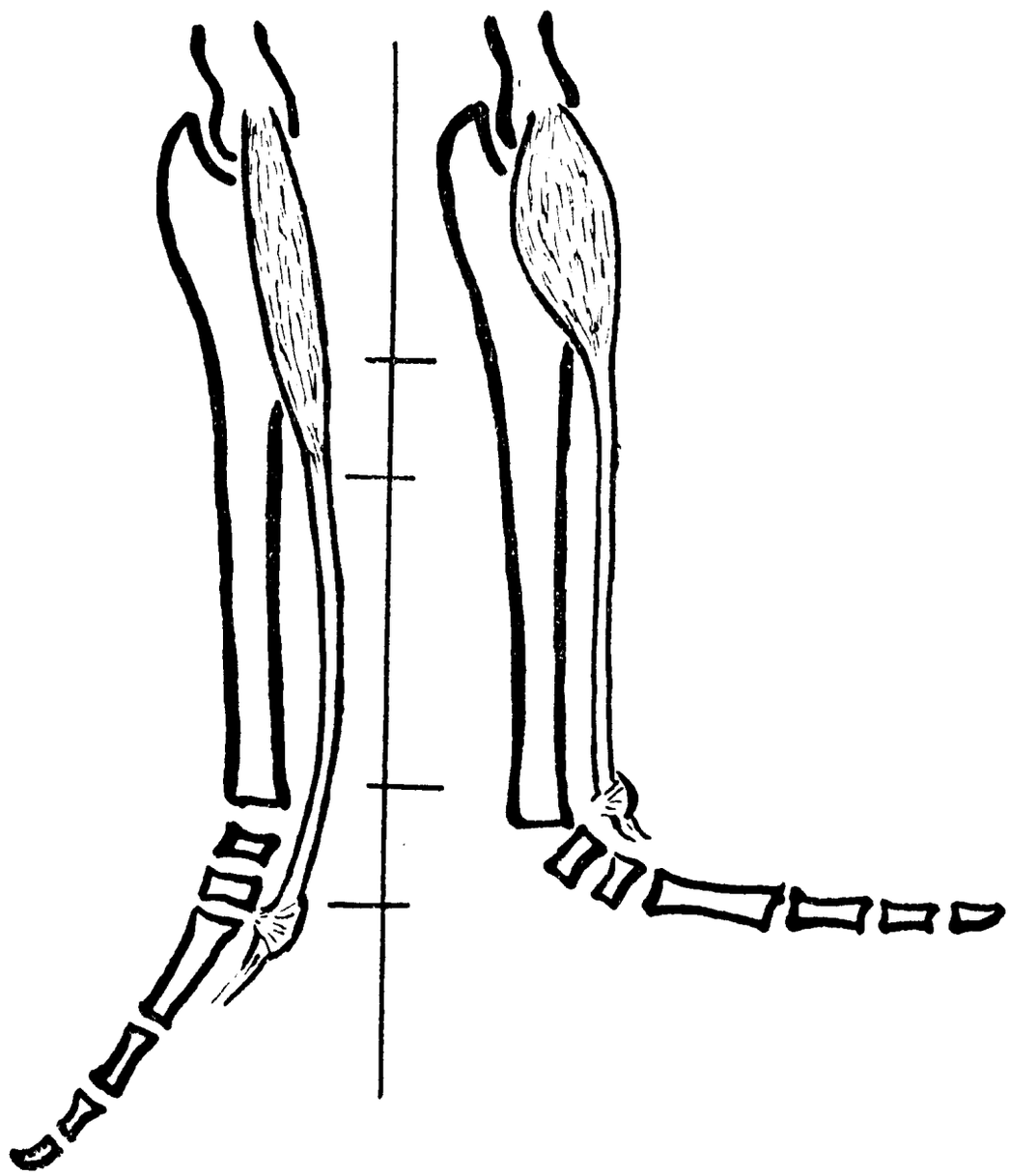


Figure 1. Illustrating the value of a non-contractile tendon in the case of the palmaris longus.

12½" to 10¼" that is a distance of 2¼". But, fortunately, only one half, of that distance is straight muscle fibre—the other half is non-contractile tendon. So that the 6¼" of muscle shortens to 4" thus contracting effectively. (Figure 1).

The significance and value of the interposition of non-contractile tendon is thus apparent.

The longer the limb, the further the insertion is from the trunk, or the closer the insertion is to the fulcrum when a long bone acts as a lever—the greater the need for a tendon; because the ratio of the range of the movement of insertion to the origin-insertion-distance is especially apt to be diminished in these cases.

Particularly in the case of some of the long muscles of the limbs then we find that the range of movement in the long axis of the muscle is less than the contracting range of muscle fibre. Here, a corresponding part of the line is occupied by non-contractile tendon.

In such situations greater strength is attained as everyone knows, in various ways:—

(1) The number of nearly parallel longitudinal muscle fibres is greatly increased thus producing a very bulky "belly" or fleshy part to the muscle. The biceps humeri is a good example. In this case there are both tendons of origin and of insertion so that the varying bulk of this big muscle does not seriously limit the movements of the adjacent elbow and shoulder joints.

(2) As one would expect with a limb tapering from the trunk towards the extremity, the muscle mass may have an extensive proximal origin from bone whilst the tendon has a small bony attachment distally. The fibres here tend to converge upon the tendon and as many are placed obliquely to the tendon their strength of pull is increased at the expense of the range of pull. Where a muscle has a fleshy origin and a tendinous insertion, the former is nearly always proximal and the latter distal. This is as one would expect in a limb which tapers distally. There are however two exceptions in the body, namely the *subclavius muscle* which arises fleshy from the under surface of the clavicle and goes by a tendon to the junction of the first rib and its costal cartilage and the *popliteus muscle* which has a muscular origin from the back of the tibia above the oblique line and a short tendon which is inserted into the anterior end of the deep groove on the lateral aspect of the lateral condyle of the femur.

(3) The oblique muscle fibres may be parallel to one another and a pennate muscle i.e. wing like arrangement is produced. The peroneus longus is an example.

(4) Or there may be two sets of parallel oblique fibres producing a bipennate muscle such as any of the dorsal interossei.

(5) Occasionally the oblique parallel fibres may be arranged in several sets passing from one tendinous intersection to another. The deltoid is a muscle of this structure.

(6) Parallel oblique fibres may pass from a tendon on one side to a tendon on the other side of the muscle. The soleus may be mentioned as an instance.

It is reasonable to assume rough correspondence between the volume or bulk of the contractile muscle and the strength as shown by the area of the cross section of its tendon.

Of course tendinous fibres will vary in tensile strength in different individuals as also of course does the power of muscle fibres in one man and another.

A tendon serves to convey the pull of a muscle to a distance When this pull is in a straight line (as for instance is the case with the palmaris longus and its tendon) the tendon is surrounded by loose areolar tissue which moves to give the tendon free play. This areolar tissue also conveys the blood vessels which supply the tendon with nourishment. But especially when a muscle with tendon passes over more than one joint, the tendon has to convey the pull of a muscle to a distance—not merely in a straight line, but also round one or more corners.

Corners in this sense are of two kinds:—

(1) External or projecting corners over which the tendons glide for example the extensor digiti tendons and

(2) internal or re-entrant corners, for example, those traversed by the flexor digiti tendons. In this class the tendons are bound down into the angle by sheath ligaments.

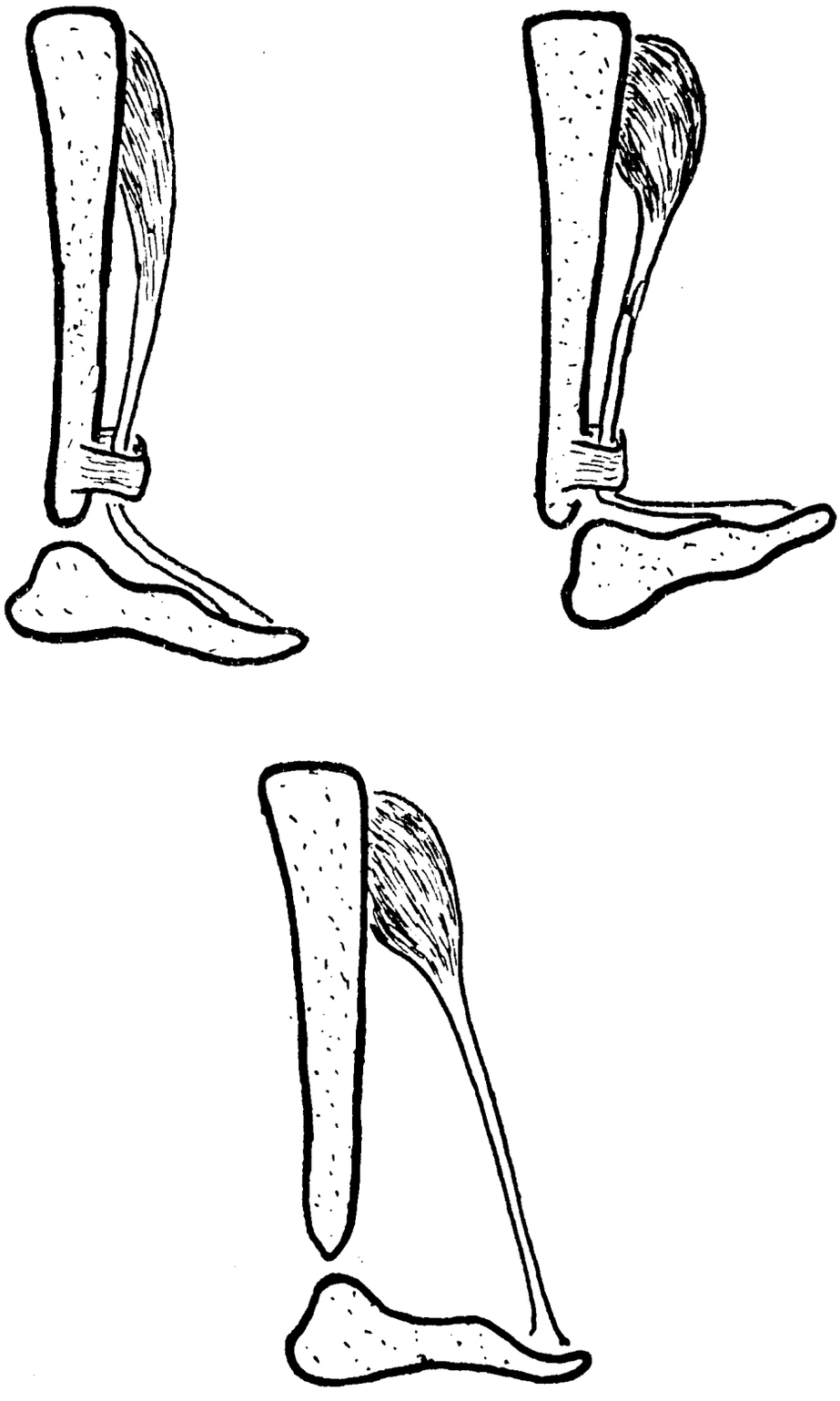
(3) Intero-external corners, that is the corner may vary from internal to external according to the position of the adjacent joint e.g. in the case of tendons passing over the wrist joint.

When a tendon passes a corner, friction is developed and the friction surface of the tendon becomes lined with synovial membrane which secretes a lubricating fluid and the surface of which appears smooth and glistening.

Where the angle is an external or projecting one it consists of bone or articular cartilage.

Bone stands friction badly, so in these situations one finds it protected by fibrous tissue covered by synovial membrane (lower end of radius) or by a thin layer of cartilage which can stand both friction and pressure (obturator internus playing over the lesser sciatic notch).

Where a tendon passes over a cartilaginous external angle it may develop osseous tissue covered by cartilage. This is a sesomoid bone. A sesamoid bone may almost be said to take the part in the body of a pulley-wheel. But its nature and action are somewhat different.



Figures 2, 3 and 4. Illustrating the value of tendon-sheath ligaments when a tendon crosses a re-entrant angle.

Actually there is usually a transverse sheath ligament both proximal and distal to the angle and a cruciate sheath ligament actually at the angle. The cruciate shape of the latter does not interfere with flexion.

Sesamoid bones seem sometimes to be developed where a stout ligament is attached to the side of the tendon.

Phylogenetically, the smoothness of the friction surfaces may be destroyed and the tendon become adherent. The part of the tendon divorced from its muscle may become a ligament as was pointed out by Bland Sutton long ago. He gave the following instances:—

Original tendon of insertion of pectoralis major, becoming the coraco humeral ligoment.

Original tendon of origin of peroneus longus, becoming the fibular collateral ligaments of the knee joint.

Original tendon of origin of peroneus longus, becoming the fibular collateral ligaments of the knee joint.

Where the angle is a re-entrant or internal one the tendon to be effective must perforce be secured within it. Otherwise when the muscle contracted instead of the insertion approaching the origin all that would happen would be that the tendon would take a shorter route from origin to insertion (Figures 2, 3 and 4). Here a smooth surface of the tendon has to play upon the synovially lined tendon sheath ligament.

In the above two cases only one surface of the tendon is exposed to severe friction and develops a perfectly smooth surface. With external angles the deep surface of the tendon is the friction surface; with internal angles the superficial aspect of the tendon becomes the friction surface. The opposite side is continuous with loose areolar tissue conveying nutrient vessels.

Sometimes the *distal insertion* moves lateralwards or medialwards as well as disto-proximally; as for instance, over the front of the ankle joint. Here the tendon is subject to friction on medial and lateral as well as superficial aspects and a mesotendon develops on the deep surface which carries the blood supply. The tibialis anterior has a mesotendon on its deep aspect.

Sometimes the mesotendon is attenuated to the joint of interruption. This is so in the case of the flexor tendons of fingers and the isolated strands of loose tissue conveying vessels have received the entirely misleading names of vincula or chains or ligamenta brevia and longa which shows a total misunderstanding of their structure and significance.

Sometimes the tendons, as at the wrist, play over some spot which forms an internal angle in certain positions of the adjacent angle and an external angle in other positions.

Here both superficial and deep aspects are liable to friction and vascular areolar tissue tends to be attached at the borders.

More rarely every aspect of the tendon is liable to be subjected to friction and this part of the tendon can only derive its nourishment from vessels running longitudinally within it. Such are tendons running within joint cavities. The longest piece of tendon thus nourished is the long head of the biceps, where it lies entirely free in the shoulder joint. The tendon of the popliteus lies clear for a short distance in the knee joint.

These points with regard to the friction surfaces of tendons and with regard to the significance of tendon sheath ligaments are of the utmost practical importance in dealing with a case of divided tendons. It is clearly of little or no use to suture a divided tendon, if in the process of doing so (1) the smooth friction surfaces of tendon and sheath are permanently damaged opposite to one another so that fixed adhesions result. (2) If the sheath ligament is permanently weakened or destroyed especially if the tendon is crossing an internal angle at this spot.

From what has already been said with regard to tendons and their shiny surfaces, sheaths and sheath ligaments it is clear that one must aim at higher ideals than have sometimes animated surgeons with regard to operations on tendons. To take the simplest case in the suture of a tendon which has been accidentally divided a mere knotting

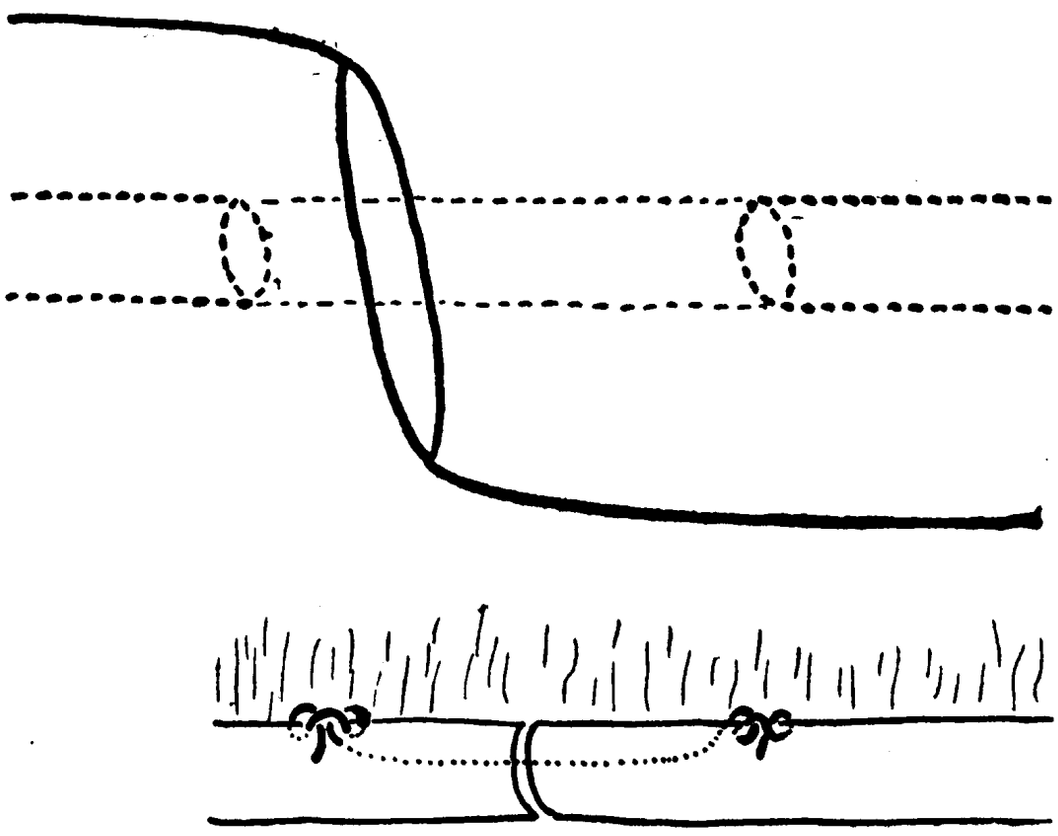


Figure 5. Suture of cut tibialis anterior tendon—
Above—Skin incisions.
Below—Position of suture and knots.

together of the tendon ends with catgut sutures is not always enough to obtain the best possible results.

If the tibialis anterior tendon just above the ankle has been divided in an accident its repair demands that the sheath shall be opened in a distal and still more in a proximal direction (as the tendon retracts one-third of its muscle length measured in the axis of the tendon). The sheath and sheath ligament must be divided at one side—not onto the shiny anterior surface of the tendon, as this might cause adhesions and the union of the sheath ligament would be weak. The invisions should be from opposite corners of the wound so as to avoid four corners of skin which would heal awkwardly (Figure 5). Skin and sheath should be raised together if possible to ensure good blood supply to the sheath. The cut ends must not be handled directly. The uniting catgut must lie in the centre or substance of the tendon to avoid adhesions. It is easy to sew this distally through the proximal cut end but an attempt to sew distally through the distal end seriously deranges the tendon, so that a special needle on a handle must be passed proximally and then threaded and withdrawn. (The needle must be "special" in the sense that it is a needle on a handle and must be a little thicker behind than at the eye).

The knots must be clove hitches on to bundles of the same size as the catgut. The knots must lie on the mesotendon side of the tendon. The proximal one is tied, the end is then passed distalwards along the centre of the tendon and threaded as described above for pulling along the inside of the distal tendon. The ankle joint is strongly dorsiflexed the cut ends drawn together and the second clove hitch tied also on the mesotendon side.

FASCIA.

Every muscle is surrounded by more or less fibrous tissue which may be called *muscle fascia.*

Where a group of muscles lie in contact with and supporting one another, the intervening muscle fascia is thin, but the fascia on the exposed or external unsupported aspects of the mass of muscles is developed into a stronger, more definite and continuous sheet, which encloses the limb musculature as a whole. This is known as deep fascia.

Muscle is a tissue which shortens and thickens under nerve stimulation. The tube of deep fascia prevents excessive distortion of a mass of powerful muscles. When a large area of deep fascia is removed, the subjacent muscle tends to bulge—the so-called hernia of muscle—and discomfort, loss of power and deformity may ensure.

Deep fascia (1) thus preserves the shape of the limb or other part and regulates the bulgings of muscular masses in action.

It is said to have a second function. (2) The continual movements of the muscles when taking place in a non-distensible tube of deep fascia much more actively squeezes the blood about in the vessels: the circulation of lymph and venous blood is supposed to be greatly favoured by the presence of deep fascia.

The deep fascia further (3) serves to give attachment to muscles. It then becomes strengthened as fascial aponeurosis. When the muscle fascia between two adjacent muscles gives attachment to some if the muscle fibres it is thickened to form an intermuscular septum. (4) Is thickened to form sheath ligaments for tendons. (5) Is thickened to act as ligaments in the neighbourhood of joints. Where a muscle sheet passes into flat aponeuroses, the muscle fascia becomes thinned out and can only be distinguished with difficulty. Such is the so-called deep layer of the superficial fascia over the lower part of the abdomen.

Muscles sometimes arise or are sometimes inserted by broad flat sheets of fibrous tissue known as apeonruoses. The largest of these are the transversus abdominis with its anterior and posterior aponeuroses, epicranius with its galea aponeurotica, volar aponeuroses, plantar aponeurosis and the central aponeurosis of the diaphragm.

Sometimes aponeurotic fibres connect the muscle fibres of two different muscles. The roof of the adductor canal is formed of oblique aponeurotic fibres forming at one and the same time both an inserton for some of the adductor fibres chiefly brevis and an origin for some of the fibres of the vastus medialis.

In the palm of the hand and the sole of the foot the spread out aponeuroses of palmaris longus and of plantaris have partly in the first case and much more in the second become divorced from their tendons and have come to form the volar and plantar aponeuroses. It has always been an amusing little trick to pull on lateral and medial borders of the palmaris longus tendon so as to spread it out fanwise to a diameter of several inches.

A muscle like the tibialis anterior may arise from the deep surface of the deep fascia, or like the tensor fasciae latae (together with all the superficial and the upper half of the deep fibres of the gluteus maximus) may be inserted into the deep fascia. Whenever this is the case the deep fascia becomes thicker and stronger and should be called aponeurotic fascia. The thickened lateral part of the deep fascia of the thigh into which the tensor fasciae latae and the gluteus maximus are inserted is of course the tractus ilio-tibialis. A muscle may arise from the muscle fascia surrounding it and separating it from other muscles. The usual somewhat delicate muscle fascia then becomes stouter and an intermuscular septum appears. Such are the anterior peroneal inter-

muscular septum, posterior peroneal septum, medial and lateral plantar septa and lateral intermuscular septum of thigh.

The principal sheets of deep fascia are as follows:—

The tubular investments and aponeuroses of the thigh, leg, arm and forearm.

In these the fibres for the most part run longitudinally with some transverse and oblique fibres lying more superficially. But the arrangement varies in different situations and is worthy of closer study.

Of these tubular investments that of the thigh provides the strongest and largest area of white fibrous tissue sheet. On the lateral aspect it is particularly thick and tough and the longitudinal fibres there form the tractus ilio tibialis and receive the insertions of the tenor fasciae latae and the superficial fibres of the lower half of the gluteus maximus. Indeed the tractus ilio tibialis is as much aponeurosis as deep fascia. Strips of fascia consisting principally of longitudinal fibres may be raised of a length of one foot and upwards. Another large sheet of fibrous tissue is the fascial aponeurosis of the back known as the lumbo-dorsal fascia. Further important sheets of fibrous tissue are provided in the aponeuroses of the abdominal wall which unites to form the rectus sheath. The posterior wall of the rectus sheath consists entirely of transversely directed fibres. In the anterior wall there is considerable irregular crossing of fibres at angles with one another. Ordinary stitches easily tear out of the former when strain is thrown upon them, but keep their hold on the anterior sheath.

The posterior aponeurosis of the transversus, by which it arises from the back is of practical importance also as it may be made use of in the operation of nephropexy by fascial suture.

We are at present engaged in accurately measuring the breaking strains of fasciae and aponeuroses. For this we employ a special tensile thread testing machine.

But we have not proceeded far enough to speak with any authority. Besides there is the obvious criticism that the tissues from an embalmed body (which alone we have tried so far) are probably much more brittle than during life. Sometime ago the Surgical Unit tried to measure the breaking strains of long bones in the human body, and there can be little doubt that embalming technique affected the fracture strain to some extent. It is probably more potent in the matter of the tensile strength of soft parts.

With the above warnings it may be mentioned that a strip of tractus ilio-tibialis 1/8 of an inch wide in a Chinese adult embalmed corpse broke at 57 lbs. In comparison it may be mentioned that an extra hard No. 1 catgut suture broke at 47/8 lbs. The 1/8 inch wide strips of even dead tractus ilio-tibialis (such a width as is used in

Gallie's fascial suture operation to which we shall refer later) are thus immensely stronger than catgut stitches.

One of the most striking advances in surgery in recent years has been Professor Gallie's work on fascial sutures (See References, A). It is no exaggeration to say that it has opened a new era in certain branches of surgery. It is particularly interesting to note that this development was founded entirely on the results of experiments on animals. The specimens from his experiments now in the museum of the Medical School at Toronto are beautifully convincing.

Professor Gallie demonstrated :—

(1) That auto-transplants of deep fascia almost invariably survived as such and continued to live indefinitely.

(2) That strips of such fascia used to close gaps under tension were not absorbed like catgut nor replaced by cicatricial tissue.

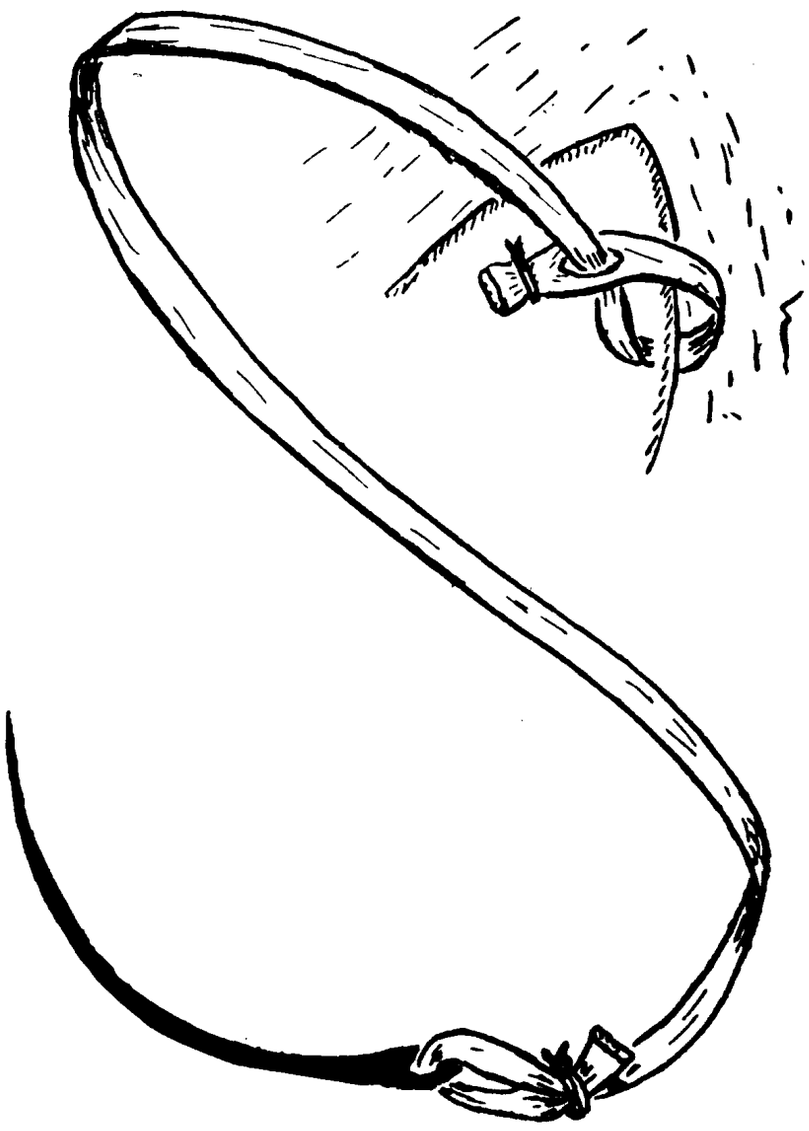


Figure 6. Gallie's fascial suture method, showing method of threading needle and the initial fixation knot.

(3) That such strips under tension did not cut through the intervening tissue as did silkworm gut, silk or other non-absorbable dead sutures.

(4) That success in the use of fascia to close gaps depended on the firm anchoring in the new bed of the fascia employed.

Professor Gallie than developed his most ingenious technique for utilising strips of the deep fascia of the thigh on its lateral aspect. The longtitudinally running fibres are especially developed in the aponerotic part of the fascia forming the tractus ilio-tibialis. He made use of strips ⅛″ and ¼″ in width.

Here are some diagrams of the technique he devised. One of the difficulties to be overcome was the intense slipperiness of fascia in that the needles became unthreaded and ordinary reef knots untied themselves.

You will see that he met the needle-threading difficulty by tying (with chromic catgut) the end to the side of the strip of fascia after threading through a specially devised large needle. (See Figure 6).

The initial fixation knot was formed by tying the free end with chromic catgut and sewing through the strip after the first stitch through the edge of the tissue to be united; the final knot by sewing through the strip and splitting the end and tying over the strip. (See Figures 7, 8 and 9). The knot might be strengthened by sewing over with catgut. The gap in the fascia lata of the thigh Gallie closed by bringing the edges together with catgut.

Attempts have been made to improve upon the cutting of strips of femoral fascia lata. Triple knives in parallel cut two strips at once. If this instrument is used, great care must be taken to cut strictly in the line of the longitudinal fibres. A subcutaneous strip cutter has been devised recently; but even greater is the danger here that the strip will cut obliquely across longitudinal fibres. Moreover Professor Gallie maintains that the long skin wound is necessary in order to close the fascial gap. If this is not done a so-called muscle hernia may develop, i.e. some protrusion—which may be unsightly—and weakness follows. A medico-legal claim was, I believe, once successful against a surgeon in the United States in a case where the patient's consent to the thigh part of the operation had not been secured previously. The fascial defect was not sutured and a muscle hernia developed. Where a very great deal of fascia has to be removed it may be impossible to close the gap and the patient should be warned of the possibility of some subsequent disability.

Pain in the thigh has occasionally followed the operation, I was informed in Toronto. But it may be and usually is, entirely painless. Some anaesthesia of the skin is inevitable especially if the fascia is taken

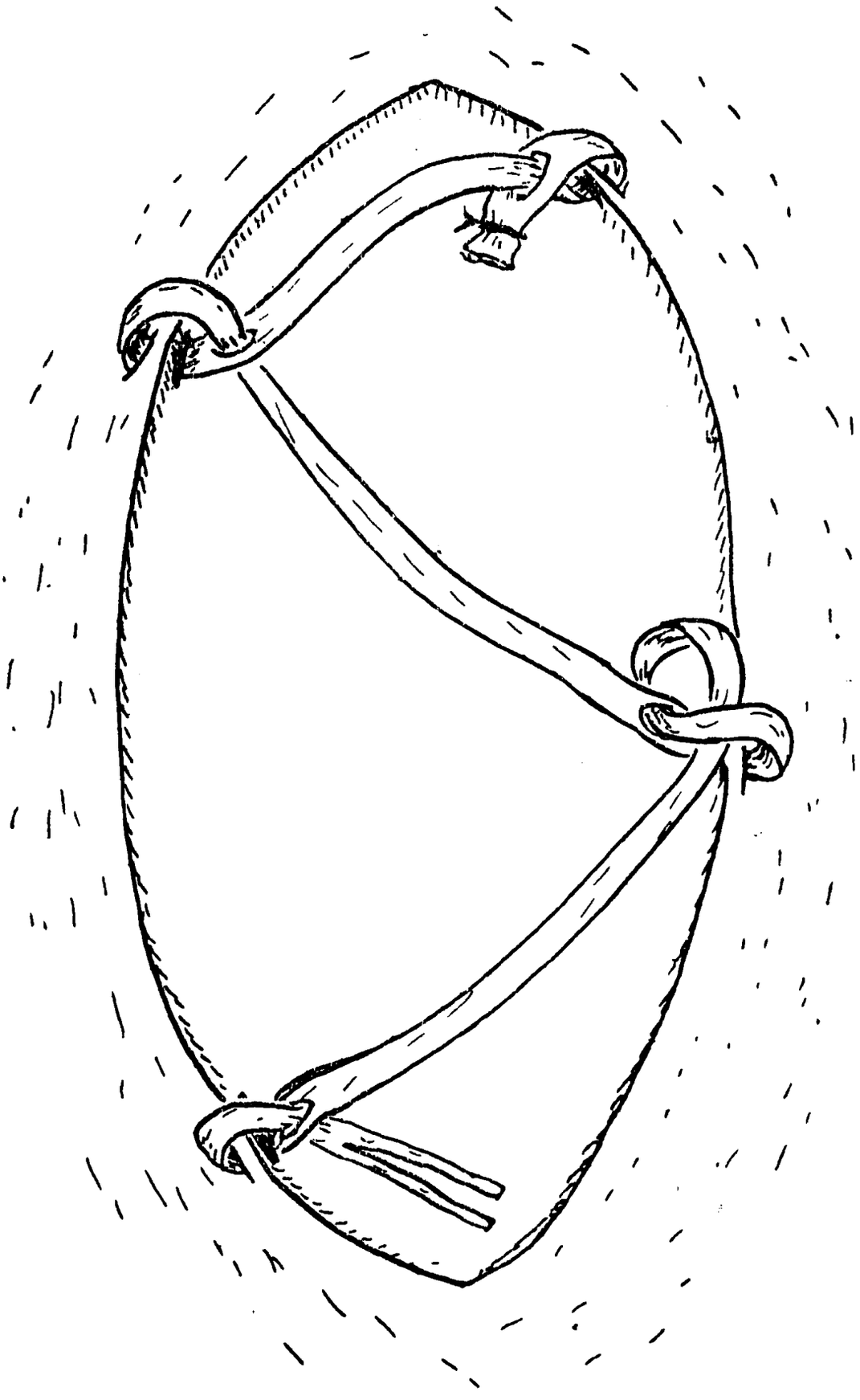
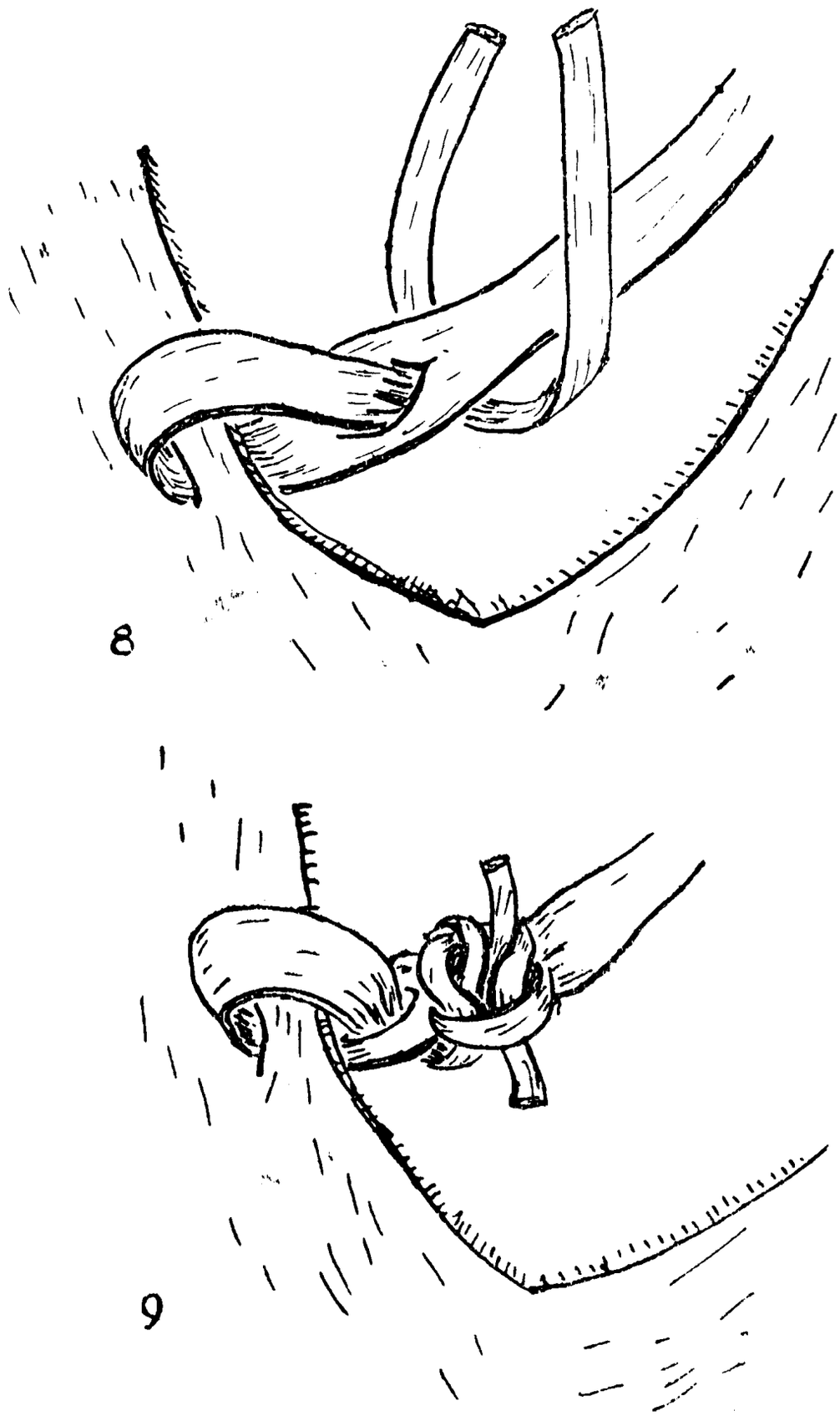


Figure 7. Gallie's fascial sature method, showing inttial knot, continuous fixing hitches and terminal knot first stage.

In order to make the diagram clearer the aponeurotic gap is represented as wide open instead as wide open instead of as being approximated.



Figures 8 and 9. Gallie's fascial suture method.

Terminal fixation knot, second and third stages.

In order to make the diagram clearer the aponsurotic gap is represented as wide open instead of as being approximated.

a little further forwards than the lateral line, as the posterior branches of the lateral femoral cutaneous nerve pass backwards.

This anaesthesia is not of much consequence and may diminish somewhat in the course of a year.

At first Gallie employed a fascial "darn" to close gaps which could not be directly approximated at all. The gap was closed by strips of fascia inerlacing just as a hole in a stocking is darned. He has since abandoned this because in a few cases hernias have recurred pushing their way between adjacent strips. Such hernias are specially liable to strangulation.

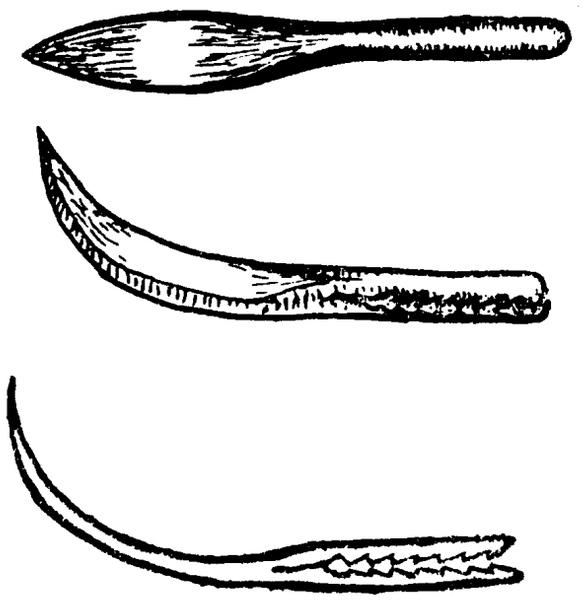


Figure 10. Special needle with crocodile jaws for holding fascial strips (actual size).

Professor Gallie has been employing another method to close large gaps, but he has not so far published an account of this. Suppose the case is one with large defect of the anterior abdominal wall. He takes a sheet of so many square inches from the deep fascia of the thigh. The top and bottom ends of this (the fibres in the femoral deep fascia run longitudinally for the most part) are snipped to form a fringe. Each strand of one fringe is threaded on a Gallie needle and brought through the aponeurotic edge on one side. The strands of the other fringe are threaded and put through the opposite margin of the gap. The strand at each end of each fringe is used to secure the sides of the sheet of fascia to the upper and lower margins of the gap in the abdominal wall. The ends of the strands of the fringes are tied together across the front of the fascial sheet, and the knots are further secured with catgut.

The Gallie fascial suture has been extensively employed in Toronto and elsewhere in hernias inguinal, umbilical, cicatricial or incisional; fractures of patella and olecranon; dislocations—recurrent of shoulder

joint (Gallie makes a new inferior gleno humeral ligament of fascia by a most ingenious operation), lateral and of clavicle (This dislocation means rupture of conoid and trapezoid ligaments. Gallie reconstructs these with a strip of deep fascia); repair of ruptured tendons and ligaments; congenital ptosis of the eyelids.

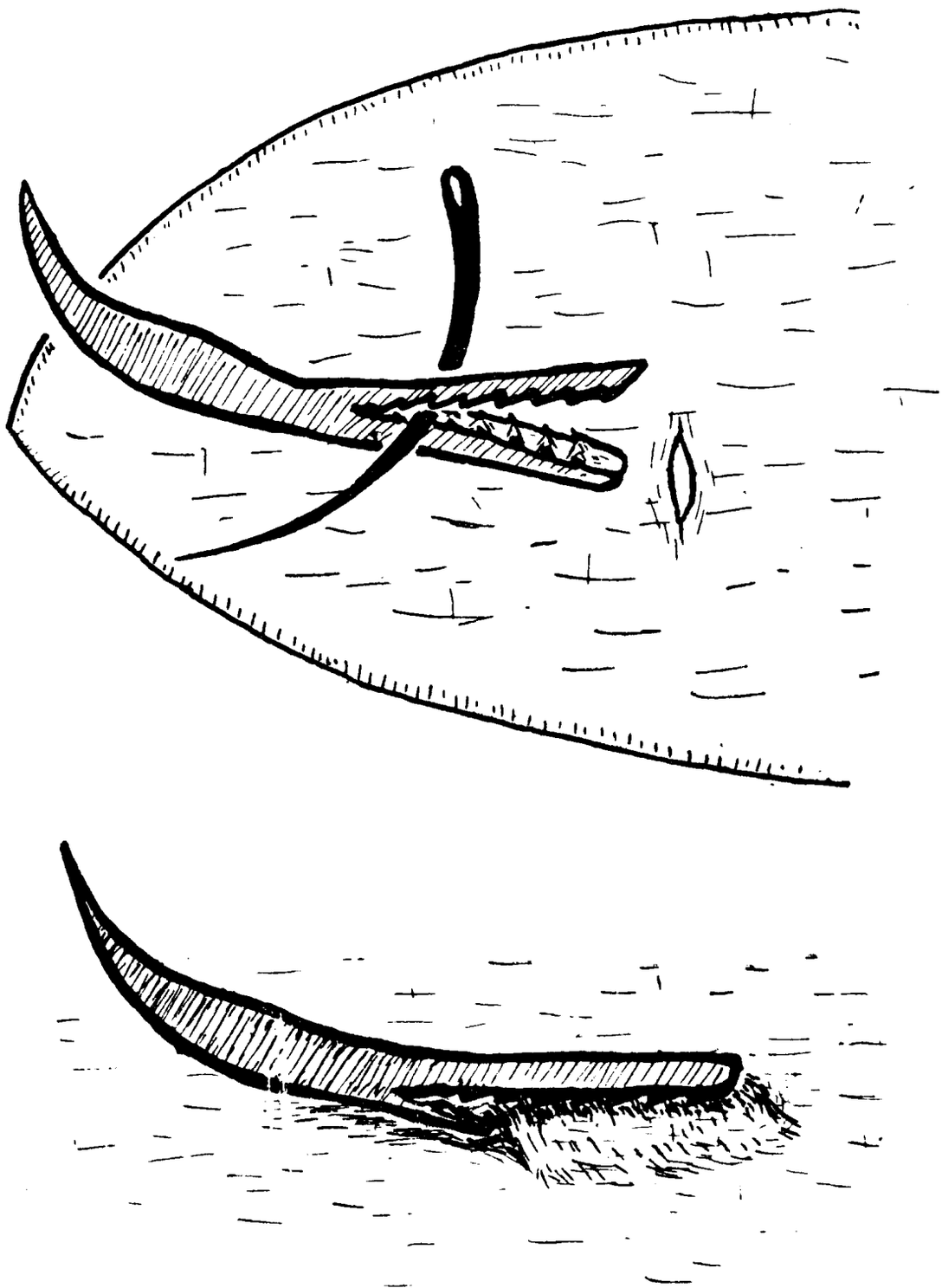


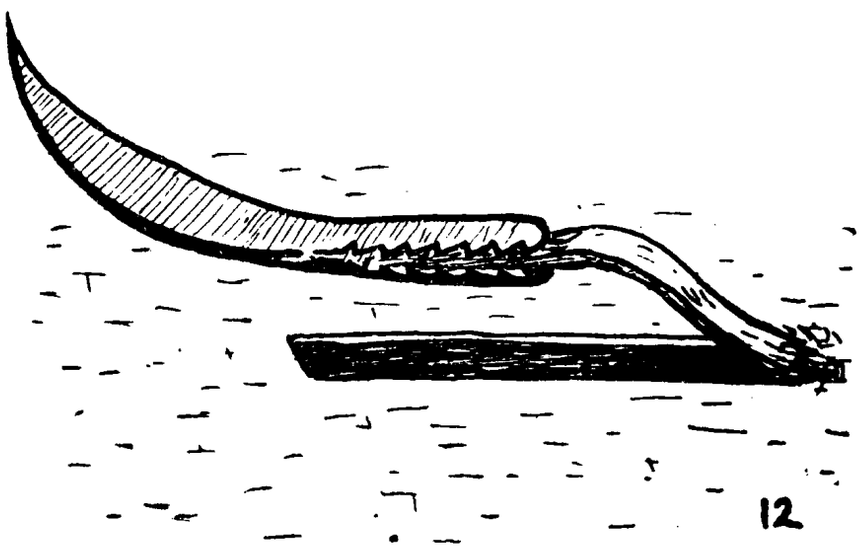
Figure 11. [*Above*] Special needle with crocodile jaws for fascial strips. Jaws prised open by another needle. A narrow transverse slit has been made in the deep fascia.

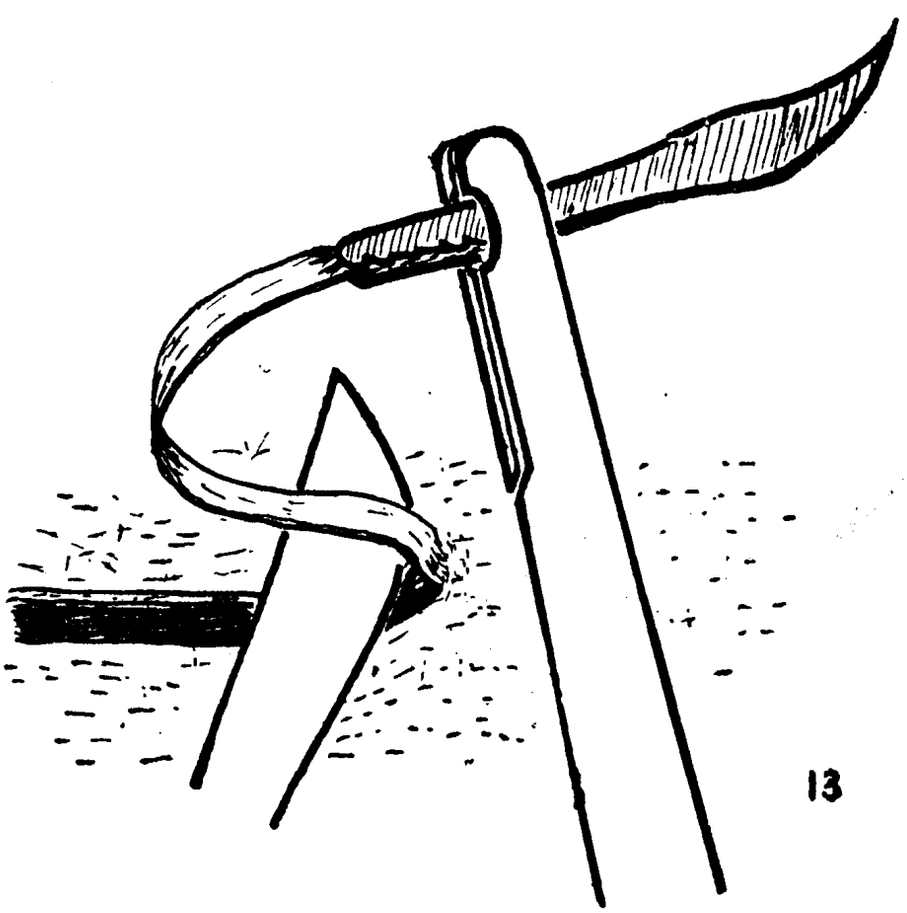
Below:—One jaw of needle thrust through cut in fascia.

But the above by no means exhausts the possibilities of the operation and a few further uses for the operation have been proposed and in some case attempted.

For spiral fractures of long bones.

For some transverse fractures of long bones.





Figures 12 and 13. Raising the fascial strip.

For displacements of viscera, kidney (where strips of posterior aponeurosis of the transversus muscle is employed) and uterus.

For facial paralysis.

For many orthopaedic deformities such as some cases of hallux valgus and neglected cases of congenital talipes equino-varus.

For giving extra support in reconstructive tube graft surgery.

For suturing the corium so that a scar will not stretch.

For spina bifida and meningocele (that is for repairing the gap after excision).

In this plastic fibrous tissue work fascia and aponeurosis are transplanted form a distance. Sometimes they can be obtained locally and two wounds are not necessary.

In this clinic in connection with congenital deformities in children we are looking for suitable cases to transplant sheets of fascia from the mother's thigh to the baby's body where mother and child are of the same blood group.

Tendons are sometimes employed instead of fascial aponeurosis.

One half of the thickness of the peroneus longus has been transplanted at the Mayo Clinic. The plantaris tendon has been used by Gallie. And the palmaris longus tendon at once suggest itself to ones mind.

Whenever a new method is introduced by one surgeon others attempt to improve upon it—though not always with success.

In the Surgical Unit we have been interested in Professor Gallie's fascial suture since the writer visited Toronto and saw his work in 1923.

The modifications we have experimented with are the following.

At first catgut double threaded on a cutting needle was joined end to end with the fascial strip. This enabled the last minute piece of the fascial strip to be employed and the fixing knot to be of catgut only. We employed a conical knot something like that used by a weaver in a cotton mill when he is joining together the two ends of a broken thread on his loom. This was demonstrated at the Biennial Conference in Hong Kong some years ago. For ordinary fascial suture work it has however proved inferior to Gallie's original method. It may however have a limited use in threading strips of fascia through drill holes in bone when fascial strips are so employed, or for other fascial suture work when Gallie's needles are not available.

A special needle with crocodile jaws for holding fascial strips is also being tried out (see Figure 10). It consists of a broad needle with

a split shank which is opened by another needle and is slipped on to the fascia before a strip is raised (see Figure 11). The serrations inside the split together with the pressure of the forceps grip prevent the strip from slipping out. If it is detached it can be reattached somewhat differently as shown in Figure 15.

Its advantage would appear to be that it saves some time in threading and in raising the fascial strip (see Figures 12 and 13). It can be utilised up to the very end of the fascial strip inasmuch as the short end can be utilised by detaching and easily reattaching it to the

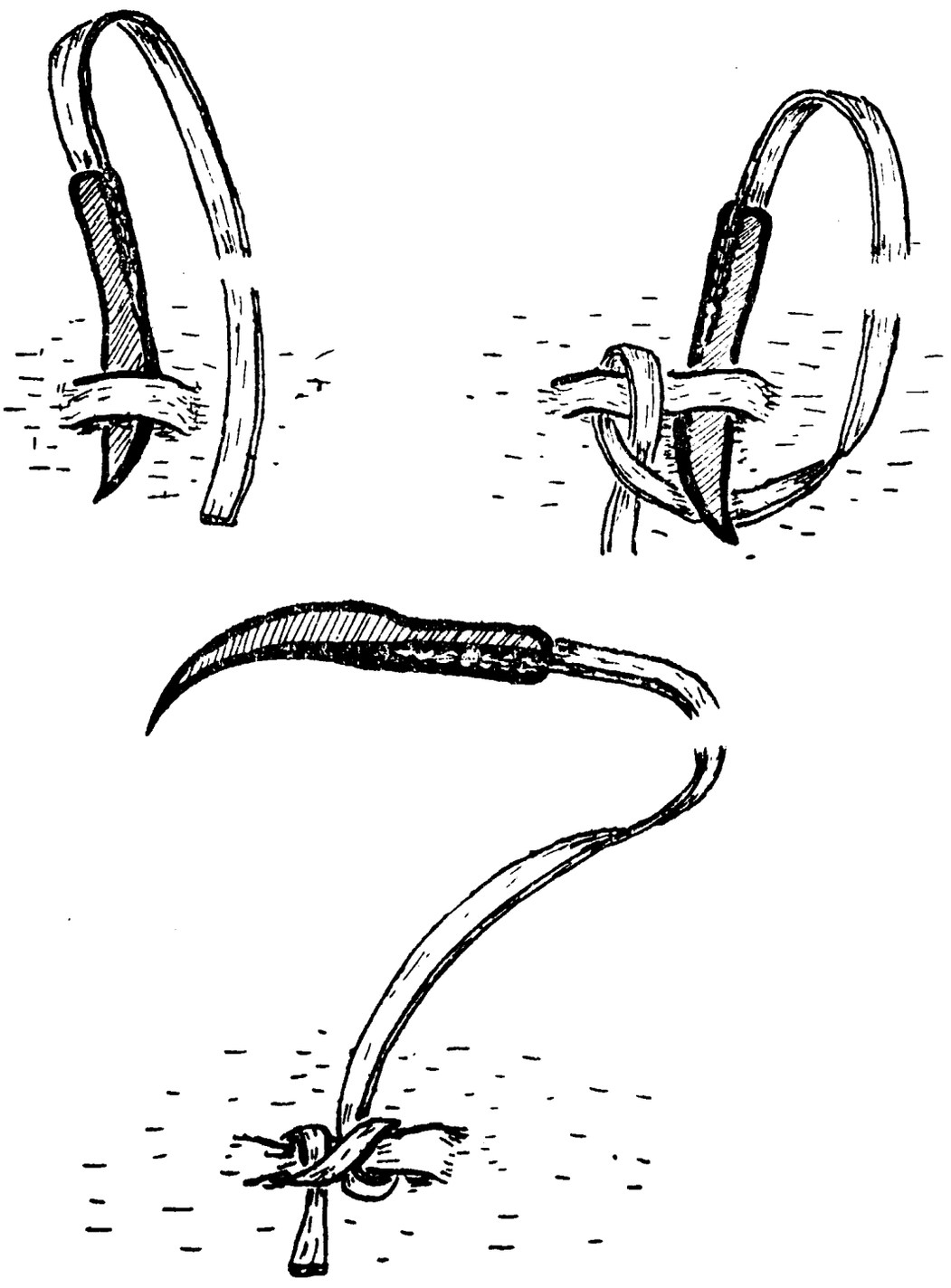
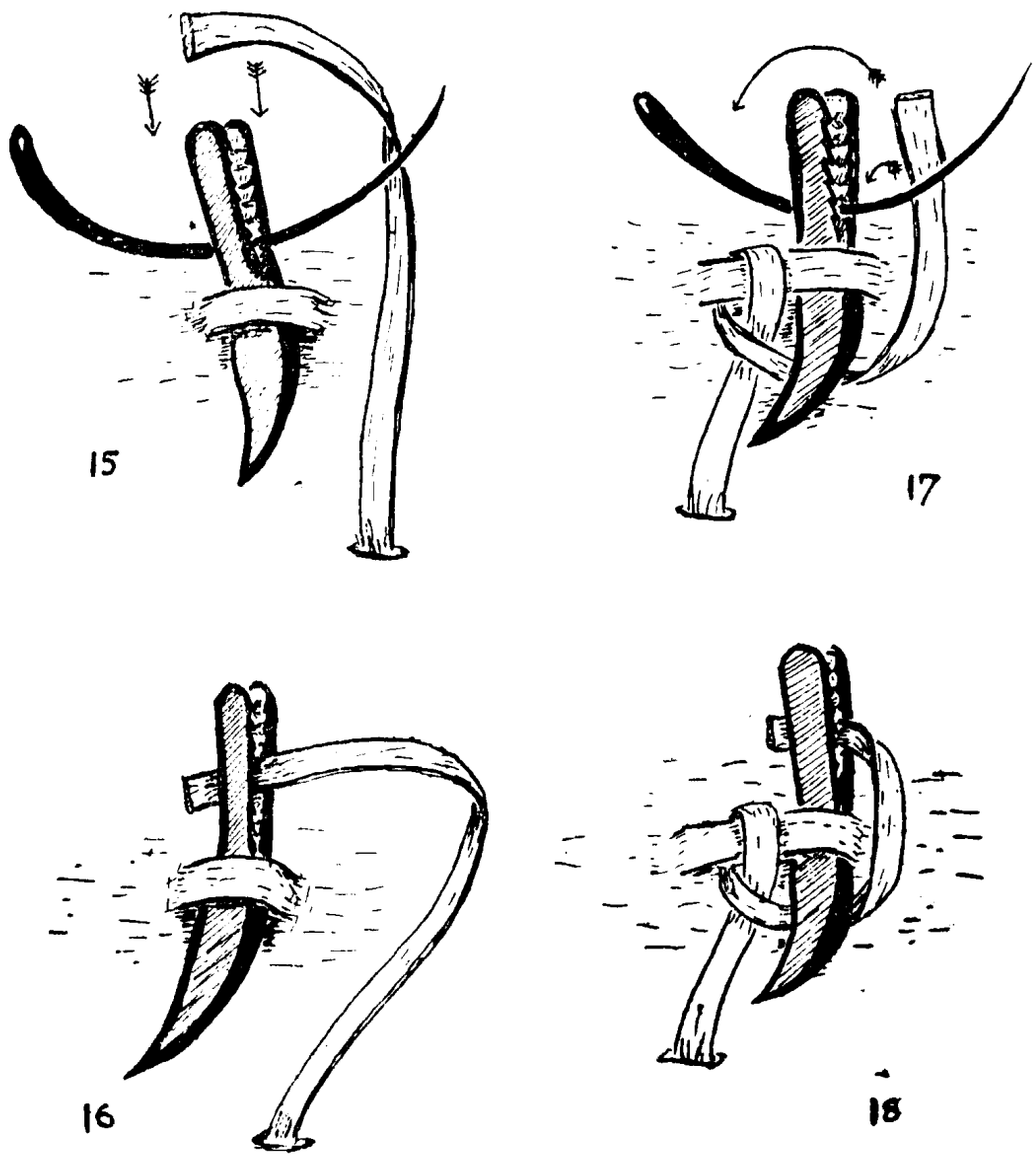


Figure 14. Sewing a clove hitch knot with fascial strip and crocodile needle.

needle after the latter has been nearly passed through the tough tissue to be united (see Figures 15, 16, 17 and 18).

A further contribution has been the trial of clove hitch knots for slippery fascial strips (see Figure 14). These seem to hold well with even the sliperiest fascial strips. They hold at right angles or even parallel to the fibres of an aponeurosis but in the latter case the included bundle must be of equal size to the fascial strip.



Figures 15, 16, 17 and 18.

From the work of Haas (see Reference B) it has recently been shown that dead as well as live fascia may be attacded to cut muscle and will serve as its tendon. But a live strip of fascia is preferable to a dead strip.

I am indebted to my assistant Dr. F. Y. Khoo for the figures illustrating this article.

REFERENCES:—A. References to Gallie's work.

1924 "The Transplantation of the Fibrous Tissues in the Repair of Anatomical Defects."
W. E. Gallie and A. B. Le Messurier.
British Journal of Surgery, Vol. XII, No. 46, 1924.

1927 "The Repair of Injuries to the Posterior Cruciate Ligaments of the Knee Joint."
W. E. Gallie and A. B. Le Messurier.
Annals of Surgery, April 1927, page 592.

1930 "The Late Results of the Living Suture Operation in Ventral and Inguinal Hernia."
W. E. Gallie and A. B. Le Messurier.
Canadian Medical Association Journal XXIII, page 165, 1930.

B. Reference to Haas' work.

Haas Arch of Surgery, 1931, XXIII, page 57.

LABORATORY AIDS IN THE DIAGNOSIS OF THE DYSPEPSIAS.*

by

Lindsay T. Ride.

Department of Physiology, University of Hong Kong.

In cases where Dyspepsia is one of the chief complaints made by patients, laboratory investigations afford very valuable aids (often important ones, but by no means the most important one) to the physician in his attempt to arrive at a correct diagnosis; and the reason why dyspepsia has been chosen as the subject of this paper is that laboratory aid in these cases is often of most indecisive type, and therefore the physician must not get into the fatal habit of relying on the laboratory for his diagnosis. This subject illustrates very well the important point which cannot be too strongly emphasised namely, that the biochemical laboratory does not, except in rare cases, give a diagnosis, it merely introduces further evidence for the clinician to weigh with or against evidence he obtains by other methods.

The clinician may be very aptly described as the general in charge of the body's defence against the attack of invading disease. A general gleans his information concerning his enemy by reports from his many types of scouts, as well as from his own experience of previous encounters; and this latter is the most important of all. It tells him how much reliance to place on the information supplied from all the other sources, and by him and by him alone can the final decision be made. This simile is very apt because in our profession the only person who can possibly make the diagnosis is the person in actual contact with the case, the person who knows all the history of the case, who has made the clinical and the X-ray examination; he is the only person who can assess the value of a report from the chemical laboratory. The man in the laboratory can hardly ever be didactic. The physician unfortunately sometimes has to be.

In an endeavour to get a true perspective of how the laboratory can aid in the diagnosis of dyspepsia, it is necessary to mention briefly most of the important methods of diagnosis available in such cases. I think one can say without hesitation that the two most important are the clinical history and the physical examination. They are all the more important because they not only very often enable a diagnosis to be made at once with a definite amount of certainty, but in other cases they definitely indicate to the clinician what are the other sources from which he may reasonably expect to get helpful information. The next in importance I should put the X-ray examination. This is merely

* Read at a Meeting of the Hong Kong branch of the British Medical Association. May, 1932.

my own personal opinion. From Apperly's writings I doubt whether he would agree with that statement for he maintains that most of the information obtained from X-ray examination can be obtained from a test meal. (In this connection one should perhaps mention the more modern work with the gastroscope, and the latest of all methods of gastric investigation, that of gastro-photography, but as I have no personal experience of either of these methods we shall pass on to the main portion of this paper, namely laboratory methods).

The main laboratory method of investigation stomach activity and function is that of the fractional test meal. This method has naturally evolved from the old Ewald test meal in which the stomach is evacuated one hour after a meal of a definite fixed type. In 1914 Rehfussin in America described the fractional method whereby samples of gastric contents can be withdrawn from the stomach at regular intervals, such samples then being subjected to chemical analysis.

Description of Tube.—The tubes used are Ryle's modification of the Rehfuss tube, No. 7 catheter size, but in some cases tubes without the lead enclosed in the end may be used and will be found entirely satisfactory. It is obvious however that where the position of the tube has to be ascertained by means of X-rays the tube containing the lead should always be used.

Description of the Meal.—The meal given is that advocated by Ryle (5) namely, two tablespoonsful of oatmeal in two pints of water, boiled down to one pint and strained through butter muslin. Apperly advocates the following meal.—2 or 3 teaspoonsful of Parson's or Robinson's groats are made into a thin paste with cold water and slowly stirred into 300 or 400 c.cm. of boiling water and the volume finally made up to 400 c.cm. The use of groats obviates the messiness of straining through muslin. Salt can be added to taste, unless chloride estimations are to be made, when the meal must be chloride free.

Description of Method of Taking Resting Juice and Samples.—In every case, after the passage of the tube, the contents of the stomach must be completely removed. The contents are known as the resting juice, and the amount should be accurately measured and examined as described later. Special care must be taken to see that the amount of saliva swallowed is reduced to a minimum by providing receptacles into which the subject can expectorate. This precaution is found to be very important for it is very easy for 50 c.cm. or more of saliva to be secreted per hour during such an experiment as this and if this saliva be swallowed, the chemistry of the stomach contents may be greatly altered. This meal is given at about body temperature and taken as quickly as is consistent with comfort, and the time at completion noted. At quarter-hour intervals from this time, samples are removed by means of an all-glass syringe, attached at the free end

of the stomach tube. In each case the volume taken, generally about 12 c.cm. is noted; a note is also made each time as to the ease with which the sample is obtained.

After each sample is removed, care must be taken to introduce a few c.cm. of air into the stomach in order to ensure that the contents of the tube are transferred back to the stomach; otherwise each sample will contain a few c.cm. of the previous sample withdrawn. Between the taking of samples, the tube is kept in position by placing on its free end a clip and either pinning the clip to a towel around the patient's neck or hanging it over the ear with a piece of tape. When the tube is first passed into the stomach, its exact position is fixed by by noting the relation of one of the black marks on the tube to the incisor teeth, and before withdrawing a sample the tube is replaced if necessary in this position. This replacement should be done very carefully because any undue movement of the end of the tube in the stomach stimulates that organ with, in many cases, consequent duodenal regurgitation.

A further precaution is necessary before the removal of a sample and that is the thorough mixing of the gastric contents to ensure that the sample is a true representative one. This is done not by moving the tube about in the stomach but by sucking contents into the syringe and forcing it back gently into the stomach two or three times before the sample is finally removed to the test tube.

If the stomach is not empty at the end of two hours after the meal is taken, the total amount of fluid in the stomach is removed and measured.

Description of Analysis of Samples.—Each sample is first of all examined by the naked eye and the presence of mucus, blood, bile, is noted together with any abnormal characteristics such as food taken previously or peculiar odour. The amount of solid residue in the bottom of the tube is also noted, and a microscopical examination of this latter made for mucous, pus and blood cells. The samples are then tested chemically for blood, starch, and quantitatively for acids (both free and combined) and chlorides by the following methods.

The *acids,* both free hydrochloric and total acidity, are measured by titrating with accurately made up N/10 NaOH. In the case of the former, dimethyl-amido-azo-benzene is used as the indicator and phenolphthalein in the latter.

The *total chlorides* are estimated by the method of Jocelyn Patterson (1); this method has been found to be highly satisfactory, the end point being a very definite one, and in cases where only a small amount of the juice is available, the method is very useful.

Method of Setting Out Results.

The results are set out on the accompanying graph sheet. In the case of the acids, the results are expressed as the number of c.cm. of N/10 chloride estimated as NaCl contained in 100 c.cm. of gastric juice. You will notice that the graph shows an irregular shaded area. This is copied from the work of Bennett & Ryle (3) who examined 100 normal English students. They found the free acid curves of these varied greatly but omitting those which were right at the top or bottom of the graph, they found the other 80% all fell within this shaded area. They therefore empirically assumed that any curve to be considered an average normal should fall within that area. Total acid curves are generally 5-15 degrees higher than the free acid.

Advantages of Fractional Method.

Ryle (3) summarises the advantages of the fractional method over that of Ewald as follows.

(1) It permits of accurate measurement of the fasting juice and a study of its mucus, bile and cell content, together with estimations of its free and total acidity.

(2) It provides in graphic form an indication of the chemical processes at each stage of gastric digestion, and detects late rises in acidity and such phenomena as continued secretion. By recording the times at which bile regurgitation occurs, it gives an indication of the occurrence of pyloric relaxation and duodenal reflux.

(3) It determines with considerable accuracy the emptying rate of the stomach for a standard meal.

(4) By combining chloride estimations with those for free and total acidity, it furnishes information relative to the factors causing neutralisation, and so indirectly again, to the function of the pylorus.

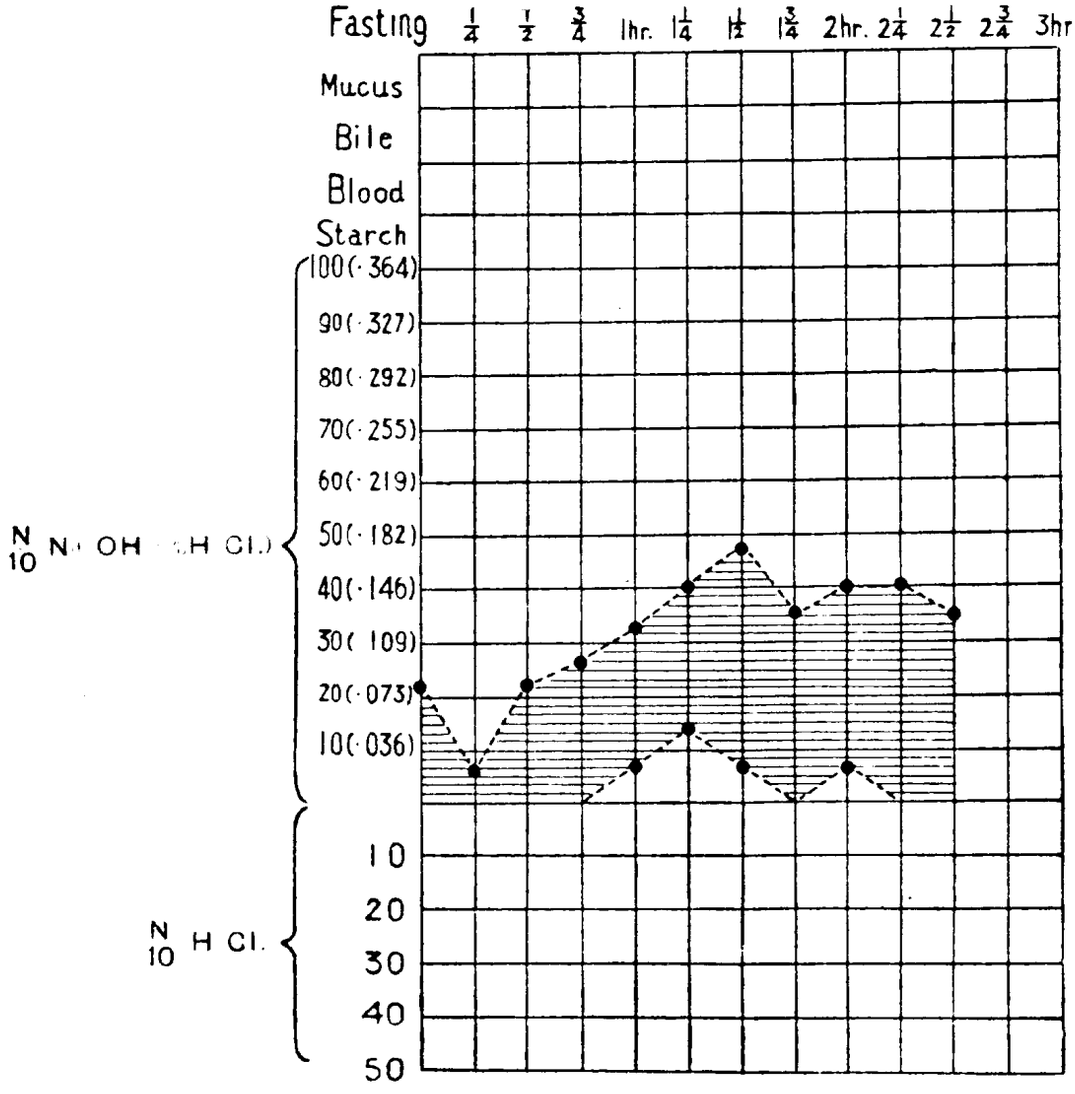
(5) In pathological cases the presence of food residue in the fasting specimen, of blood or pus in this or subsequent specimens, the odour of the samples and other physical characters may also be observed.

He also summarises the disadvantages as follows:

(1) The action of the tube as a foreign body in the stomach. The experiments of Beaumont early last century however and those of Pavlov on animals, seem to indicate that inert foreign bodies have no influence on the secretory functions of the stomach.

(2) Stimulation of excessive salivation which tends to dilute and neutralise free acid. This is a real objection, but as mentioned above it can be reduced to a minimum by providing a receptacle for the patient and directing him to use it rather than to swallow his saliva. The method of detecting swallowed saliva will be mentioned later.

I. FRACTIONAL TEST-MEAL.



The shaded area represents the limits for free HCl. in 80% of normal people, and average rate of emptying (2-2½ hours).

.....represents free HCl.

(3) Diminution of the psychic secretion by the circumstances of the test and the unappetising character of the meal. Recent work seems to show that the psychic secretion in man is not very large, especially in comparison with later secretion, and at any rate the method is a comparative one and the meal is the same for every case.

(4) Emotional inhibition or exaggeration of secretion during the test and

(5) Duodenal regurgitation from retching.

These tend to be real difficulties when they occur, but fortunately they are not very frequent. But it is very important to realise that here the laboratory manner is just as important in the laboratory as the bedside manner is to the clinician. One must know when to persuade and when to be firm. All preparations should be done before hand and out of sight of the patient. There must be complete assurance of the patient of the ease and the rapidity of the passage of the tube, and on no account must instructions be given before hand as to what to do if vomiting occurs. If this possibility is mentioned, vomiting will be sure to occur.

When the tube is on the way, complete charge of the situation must be taken by the doctor and on no account must the tube be allowed to be returned. There are commonly three difficult points in the passage of the tube. The first when the end of the tube is passing from the mouth to the oesophagus, the second as it passes the bifurcation of the trachea, and the third as it meets the cardiac sphincter. These positions are readily recognised, and the physician must be ready for them because it is at these points that difficulty is experienced and the consequent tendency on the part of the patient to return the tube. The patient is instructed to sit comfortably in a chair, head slightly back, neck free from incumberances, such as tight collars, etc., and told when the tube is placed on the back of the tongue to swallow. The tube is held by the physician and not by the patient, for the latter would almost invariably involuntarily withdraw the tube. Its passage may be assisted by first of all dipping the end in glycerine.

On the first sign of retching the patient must be instructed to stop swallowing and to breathe hard through the OPEN mouth until the desire to vomit has subsided, which it does quite readily. It is important that the mouth should be open or otherwise the tube will be pushed against the soft palate and the posterior pharyngeal wall and increase the discomfort.

When the tube is in position in the stomach the patient should be assured that the discomfort will soon pass off; it is really remarkable how even patients who have had the greatest difficulty in getting the tube down, rapidly become insensible to the tube's presence.

With regard to duodenal retching, this can be minimised by very gentle manipulation all through the test. This I consider of utmost importance for my experience is leading me to believe that the so-called normal appearance of bile in the test meal after the first hour is due to the stimulation of the pylorus by the end of the tube being pushed against it by the normal peristaltic waves, and if we could keep it back from the pyloric region altogether we should probably get no bile at all. In this connection see the work of Beaumont referred to above.

(6) Variation from day to day in the curve of a given subject This objection also applies to the Ewald meal, but it has been shown that these variations are very small and that even in the cases where it does occur the type of curve obtained is the same generally.

(7) Variation in acidity at different levels in the stomach. This is counteracted by the method of gently mixing the stomach contents each time before withdrawing a specimen.
With regard to these objections I should like to draw your attention to some curves I got a couple of years ago (2). In this case, a second meal was given immediately after the first without removal of the tube and the curves obtained with the first and second meals were plotted together and coincided very accurately.

I should here just like to mention two other variations of the above method which are being advocated to-day in America. One is stimulating a flow of gastric juice by placing alcohol in the stomach the other by injecting subcutaneously histamine or ergamine acid phosphate. The great argument in favour of these methods is that the gastric contents are obtained free from food material. I have not used either of them at all, but generally speaking the presence of food material is not a disadvantage, rather otherwise for it is used as a pretty accurate test for the emptying time of the stomach, and furthermore, the original fractional method gives us a picture of the way the stomach deals with a fairly normal meal. In these two latter methods the circumstances are completely artificial.

Interpretation of Results.

In this section I propose to deal with each type of finding and to discuss its significance both on its own and in conjunction with other findings. I do not propose to attempt to take each type of dyspepsia separately and to state what should be found in each case. Such a procedure as I pointed out earlier would be completely useless.

Mucus.

Mucus in samples may come from two main sources (*a*) mouth, (*b*) œsophagus and stomach. We have seen already, how the amount of the former can be kept down to a minimum. But how can one be

sure of the origin of the mucus that one finds even after these precautions? After a number of examinations one finds that mucus is of two types. (*a*) that which occurs in lumps, often aerated, and tends to float, and (b) that which is more or less intimately mixed with gastric contents. The former has been swallowed and the latter has come from the stomach wall. Its function is to protect the stomach lining and if present in large amount, is indicative of an inflamed mucous membrane. One therefore expects to find an excess of mucus in gastritis, alcoholic or other irritative dyspepsias and in those cases of peptic ulcer where pyloric obstruction has supervened. In these cases along with obstructing carcinoma ventriculi the decomposition of the delayed contents provide the irritation.

Occasionally one comes across cases in which the fasting juice is practically wholly composed of mucus. In such cases the stomach must be carefully and completely washed out through the tube before the fractional test is begun. These cases often show low acid curves, but if this precaution is taken, the resulting curve is generally found to be quite normal.

Blood.

Small specks or streaks of blood in some of the samples are generally of no moment because of liability of injury to the mucous membrane by the tube. The probability of blood being derived from this source must be reduced to a minimum by gentle manipulation especially when withdrawing samples. One must learn to detect whether the difficulty in obtaining a sample is due to the tube being plugged with mucus or food, or due to the stomach being empty. On no account must the syringe be used energetically. Obvious or changed blood in the fasting juice and in most of the samples is almost diagnostic of cancer or ulcer.

Cells.

All sediment should be examined microscopically for evidence of blood pus and cancer cells, and there is no need to dwell on the significance of the findings under these headings.

Bile.

Under the conditions of the test, bile is nearly always present especially after one hour when apparently duodenal regurgitation commonly occurs. It may be present in the fasting juice and in all other samples especially if the patient has had difficulty in swallowing the tube and there has been retching. Even attempted retching will cause the return of bile to the stomach and therefore its presence is of no great significance. It must however be remembered that if bile comes back so also will carbonate and neutralise some acid causing a fall in the acid curve with no marked alteration in chlorides.

Amount of Fasting Juice.

This varies enormously from a few c.cm. obtained with difficulty, to over 100 c.cm. the average being about 50 c.cm. I have however seen a normal case with 280 c.cm. A low volume means nothing, but a high volume such as the one just mentioned especially if associated with high acid must be regarded as indicating either pyloric obstruction, plylorospasm, ulcer or, if with low acid, an atonic condition of the stomach wall, a type typically found in the narrow chested, low acid individual with the hypotonic stomach as found by X-ray.

The character of the fasting juice is of course very important, and it has already been referred to above.

Starch.

The disappearance of starch as determined by the iodine test is evidence of time of emptying of stomach. This is often much more accurate than the rate of emptying as shown by X-ray because in the latter case one is using an abnormally heavy meal and also a small amount of barium adhering to the stomach wall will cast a shadow. According to the iodine test the stomach is usually empty between 1½ to 2 hours after the meal. If there is any meal left at the end of two hours, one generally removes it all and measures the amount. Rapid emptying need not necessarily be pathological, it is common amongst the hypertonic types, usually found in broad chested athletic individuals who generally also show a high acid curve. But it must be noted that these are just the people among whom duodenal ulcer is commonest. Rapid emptying is also found among the neuroses generally associated with a high and rapidly rising acid curve and in some cases of carcinoma with a rigid pyloric insufficiency as in achylia gastrica and also, one must not forget, after gastro-jejunostomy with a widely patent stoma. It is as well to bear in mind that this rapid emptying may be the cause of an otherwise unexplained diarrhoea, e.g., painless morning or post-prandial diarrhoea.

Delay in emptying may also be found in the hypotonic stomach but cases of marked delay must be carefully examined from every angle for they are most commonly associated with organic lesions. Delay with a high acid curve is often found with cicatrized peptic ulcers, and in delay with low acid one, one must seriously suspect carcinoma involving the pylorus.

Amount of Residue.

In normal cases the amount of residue in each succeeding sample gets smaller and smaller, and at last it gradually disappears about the same time as the starch. But a rapid disappearance of residue may not necessarily mean rapid evacuation; it may be caused by increased dilution of gastric contents by swallowed saliva, increased gastric

secretion, or marked regurgitation. The former cause we have already noted how to control and detect, and the latter is indicated by the presence of bile.

By similar reasoning we see that diminished dilution of residue may either mean delayed emptying or diminished secretion (the latter being most often due to carcinoma or gastritis). It is therefore very obvious that the evidence of the amount of residue must never be considered alone but only in conjunction with the acid and starch curve.

Acid Curves.

The variations in the acid curves among normal individuals compels us to recognise that neither hyper nor hypo-chlorhydria are in themselves pathological. But they are, nevertheless, just as often associated with pathological conditions. Complete achylia may be primary in healthy individuals or in those suffering from Addison's anaemia, or it may be secondary to chronic gastritis or scarlet fever.

Hypochlorhydria may be due to excessive neutralisation (*a*) following an abnormally patent pylorus, or gastro-jejunal stoma, (*b*) by exudates from a growth or (*c*) by the excessive mucus of gastritis. The best clue to the secondary hyperchlorhydrias mentioned above is the wide interval between the total acid and the base line and the lack of parallelism between them and the chlorides. Again hypochlorhydria with mucus favours gastritis; with blood, carcinoma.

Hyperchlorhydria.

This is most commonly met with physiologically in the steer-horn stomach of the athletic type. But pathologically it is a most common accompaniment of duodenal ulcer, nervous dyspepsia, the neuroses, gastric ulcer, and less commonly gall stones, reflex dyspepsia, tabes and rheumatoid arthritis.

Perhaps I had better conclude by stating what are in my opinion (and here I shall be only too pleased to have your criticisms) the commonest dyspeptic conditions in Hong Kong where the laboratory may aid the clinician. They are carcinoma ventriculi, sprue, peptic ulcer, Addison's anaemia and diarrhoea of obscure origin.

REFERENCES.

(1) Patterson, Jocelyn, Lancet CCXIV, 1928, March 10, page 492.

(2) Ride & Wong, Caduceus, Vol. 10, No. 1, February 1931, page 56.

(3) Ryle, J. A., Gastric Function in Health and Disease.

Acknowledgements.

The Hospital.
The Nagoya Journal of Med. Science.
The New Zealand Medical Journal.
St. Thomas Medical Gazette.
Fukuoka Ikwaidaigaku Zasshi.
Okayama Igakkai Zasshi.
Keijo Journal of Medicine.
The Moukden Medical College Journal.
St. Bartholomew's Hospital Journal.
Health & Empire.
The Bristol Medico Chirurgical Journal.
The Birmingham Medical Journal.
Journal of Bone & Joint Surgery.
University College Hospital Magazine.
St. Mary's Hospital Gazette.
Revista de la Facultad de Medicina.
Chinesche Zeitschrift fur die Gesamte Medizin.
Tohoku Journal of Experimental Medicine.
Ulster Medical Journal.
Post Graduate Medical Journal.
Lingnan Science Journal.
Manchester University—Med. School Gazette.
Mitteilungen Aus der Medizinischen Akademie.
McGill Medical Undergraduate Journal of Maryland.
Journal of the Chosen Medical Association.
Universidad Nacional Bogota Facultad de Medicina.

Review of Books.

"*DIAGNOSIS AND TREATMENT OF VENEREAL DISEASE,*"

By David Lees, M.B., F.R.C.S. (E. & S. Livingstone, 16 & 17, Teviot Place, Edinburgh). (2nd Edition 1931). Price 15/- nett.

This book is the ideal volume for the study of venereal diseases for the student and the practitioner.

It is not so much a collection of current literature as a result of the vast clinical and practical experience of the author. More imposing works have been published during the past few years, but in the opinion of the reviewer none have the same practical value as this volume.

The subject has been dealt with in a concise and effective manner, and brings before the student all the essentials of Venereal Diseases from the clinical and practical sides.

This is the second edition and has been added to in many ways, especially in the treatment of neuro-syphilis and especially the benefit of tryparsamide in this connection. After an intensive clinical trial Mr. Lees has come to the conclusion that this drug has completely altered the prognosis in neuro-syphilis.

The illustrations, especially the new coloured plates, help greatly in reading the context, as the reader sees these in front of him as he reads.

Altogether it is a very sound volume and should be in the hands of all students who are studying for examinations, and practioner, who want a good guide for treatment of Venereal Disease in general practice.

"*AN INTRODUCTION TO HYGIENE,*" by W. Robertson, M.D., D.P.H., F.R.C.P. (E.). E. & S. Livingstone, Edinburgh. 6/- net.

This small book is not intended as a text book of Hygiene or to replace those already in existence. All that is claimed for it by the Author is that it may prove a useful introduction to this very large subject, for graduates interested in it.

The book is well printed and easy to read. The subject matter is clear, concise, and to the point, and is divided into convenient short chapters. The chapters are arranged in an excellent grouping beginning with the organization of the Public Health Service, the various Public Health Acts, Laws and Regulations, and for this reason the book should prove an extremely useful handbook to those employed in Public Health Administration.

The subject matter is up to date in view of recent knowledge. The introduction to Infectious Diseases in Chapter VI clarifies the procedure in dealing with Infectious Diseases from a modern standpoint.

Under the heading of " Enteric " it is noted that the domestic filters of Pasteur-Chamberland and Berkefeld types are given as adequate in preventing the spread of Enteric by means of water. Filters of this type are excellent if properly looked after and the candles washed, scrubbed and boiled at least every 3 days; a practice seldom carried out. On the other hand it has been definitely shown that when not properly looked after organisms can grow through them.

A Printer's error has crept in or Page 142, Paragraph 3. It is unfortunate that " Collection and Disposal of Household Refuse " has been included in the chapter on Water Purification. This should form a separate chapter or be grouped with House Drainage under the heading " Collection and Disposal of Household and other refuse."

In conclusion the book is an excellent handbook in Hygiene and should prove as a noteworthy aid to students in Public Health.