

1 **Perceptions of single-visit and multiple-visit endodontic treatment: a survey on**  
2 **endodontic specialists and general dentists in Hong Kong**

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15 **Abstract**

16 *Objectives:* This survey aims to study the preference of practice of single-visit and multiple-  
17 visit endodontic treatment by endodontists and general dental practitioners (GDPs) in Hong  
18 Kong, and to investigate their reasons to choose single-visit or multiple-visit treatment in  
19 their practice.

20 *Method:* An anonymous questionnaire was mailed to all 16 registered endodontists and 800  
21 randomly selected GDPs in Hong Kong to explore their preference and reasons of practicing  
22 single-visit and multiple-visit endodontic treatment on their patients. Information on their use  
23 of magnifying loupes, microscope and their year of dental practice were also collected.

24 *Results:* A total of 8 endodontists and 429 GDPs returned their questionnaires and the  
25 response rate was 50% and 53.6%. Among these 404 of 429 GDPs (94.2%) practiced  
26 endodontic treatment. For those performing endodontic treatment, their mean ( $\pm$ SD) years of  
27 practice was  $23.6\pm 4.8$  for endodontists and  $15.3\pm 9.1$  for GDPs. Majority of endodontists used  
28 surgical microscope. For GDPs, only 25 (6.2%) used surgical microscope and 123 (30.4%)  
29 used magnifying loupes during endodontic treatment. Most endodontists ( $n=7$ , 87.5%) and  
30 GDPs ( $n=375$ , 92.8%) predominantly performed multiple-visit treatment. The commonest  
31 reason for choosing multiple-visit treatment for endodontists and GDPs were the positive  
32 effects of inter-appointment medications ( $n=3$ , 37.5%) and the tooth treated had doubtful  
33 prognosis ( $n=103$ , 25.5%) respectively. While the commonest reason for choosing single-  
34 visit treatment for endodontists and general dentists were the same that treatment can be  
35 completed in one visit ( $n=4$ , 50%) and ( $n=127$ , 31.4%).

36 *Conclusion:* According to this survey, most Hong Kong endodontists and GDPs preferred  
37 offering multiple-visit endodontic treatment.

38 **Introduction**

39 Traditional endodontic (root canal) treatment used to take multiple visits to complete, with  
40 one of the main reasons for this being that it requires a considerable amount of time to  
41 complete the treatment. The use of contemporary endodontics techniques and equipment such  
42 as magnifying devices, electronic apex locators, engine-driven rotary nickel titanium files,  
43 and so forth not only increases the success rate of endodontic treatment, but also shortens the  
44 time needed for the treatment. Endodontic treatment may therefore be completed in a single  
45 visit. In fact, the concept of single-visit endodontic treatment is not new, the single-visit and  
46 multiple-visit endodontic treatment has been the subject of discussion among the dental  
47 professionals for many years yet there has been no definitive conclusion to the debate.  
48 (Sathorn *et al.* 2009). Some of the unresolved issues include possible differences in  
49 anticipated success rate, clinical outcomes, microbiological concerns, pain and other post-  
50 treatment complications. This controversy can be investigated and a recent systematic review  
51 could not found significant difference in treatment outcome (Wong *et al.* 2014). The decision  
52 of dentists to choose single-visit or multiple visit endodontic treatment clinicians may be  
53 influenced not only by effectiveness, complications and cost but also by factors such as  
54 patient and/or operator comfort, preference and satisfaction (Sackett 2000).

55

56 Sathorn *et al.* (2009) pointed out that an important consideration in treatment decision-  
57 making is the human factor (Sathorn *et al.* 2009). The treatment decision-making is highly  
58 dependent on the dentists, and they in general are more influential than any other parties in  
59 the treatment decision. They in many cases are not likely to offer patients a choice between  
60 single-visit and multiple-visit treatments because their clinical perceptions including  
61 treatment philosophy, rationale and preference for the different treatment options (Sathorn *et*  
62 *al.* 2009). This is in particular pertaining to endodontic treatment, which is a skill-dependent

63 procedure. The choice of treatment depends on the dentist skill, experience and preference,  
64 comfort, habit and convenience. The implementation of new concepts, treatments or  
65 techniques may depend not only on their biological rationale or effectiveness. Some clinical  
66 procedures are not widely implemented for the simple reason that they are too difficult or too  
67 inconvenient to perform, even though they have a strong biological rationale. Infrequent use  
68 of magnifying loupes and application of rubber dam are two common examples in dental  
69 practice. Messer (1999) concluded that the clinical judgment for general dental practitioners  
70 GDPs on endodontic treatment would be complicated and not relied simply on the practical  
71 clinical aspects (Messer 1999).

72

73 A recent study in Brazil reported that Florianopolis-Brazil endodontists prefer multiple-visit  
74 over single-visit endodontic treatment when the tooth had pulp necrosis (Netto *et al.* 2014).  
75 Another study reported that Australian endodontists strongly preferred multiple-visit over  
76 single-visit root canal treatment even in cases where biological concerns were not an issue  
77 (Sathorn *et al.*, 2009). Furthermore, they found that operator preference rather than biological  
78 or patient considerations appeared to be the primary determinant of treatment choice.  
79 Inamoto *et al.* (2002) suggested that single-visit endodontic treatment was not popular in  
80 Japan, and in US, only approximately one third of the dentists would perform root canal  
81 obturation at the first visit in infected root canal cases (Inamoto *et al.* 2002). One survey also  
82 reported that most of the Flemish GDPs completed the endodontic treatment in two-visits  
83 (Slaus & Bottenberg 2002). However, a study using self-administered questions in US found  
84 most patients preferred single-visit endodontic treatment regardless of success rates (Vela *et*  
85 *al.* 2012). A literature search found that there was no study conduct to investigate the  
86 dentist's preference of choosing single-visit or multiple-visit treatment in Hong Kong. The  
87 objective of this study was therefore to study the preference of practice of single-visit and

88 multiple-visit endodontic treatment by endodontic specialists and general dentists in Hong  
89 Kong, and to investigate their reasons to choose single-visit or multiple-visit treatment in  
90 their practice.

91

92

### 93 **Method**

94 This study was conducted in February to June 2014 with ethics approval from the  
95 Institutional Review Board of the University of Hong Kong / Hospital Authority Hong Kong  
96 West Cluster (HKU/HA HKW IRB UW No. 14-131). The study population was divided into  
97 two groups, 1) endodontist and 2) GDP. There are 2,087 GDPs from the general register and  
98 16 endodontists from the specialist register of the Hong Kong Dental Council. This study  
99 invited all 16 registered endodontists and randomly selected 800 GDPs for a questionnaire  
100 survey. An invitation letter was sent in February 2014 with an anonymous self-administered  
101 questionnaire attached (Figure 1). They were asked to complete and to return the  
102 questionnaire with the self-addressed stamped envelope or by facsimile. A reminder mail was  
103 sent to all invited clinicians after 4 weeks to encourage the response rate of the survey.

104

105 Before designing the questionnaire, a systematic literature search was performed (Wong *et al.*  
106 2014) and the common factors influencing the choice of using single-visit and multiple-visit  
107 endodontic treatment were identified. Information on perception of single-visit and multiple-  
108 visit endodontic treatment from the selected general dentists and endodontists was obtained,  
109 and a total of 10 close-ended questions were developed in the one page questionnaire. The  
110 questionnaire was pilot tested to 10 dentists and feedbacks were collected before the main  
111 study. Amendments were made according to the 10 dentists' comments. The final  
112 questionnaire contained a list of identified common influencing factors for single-visit and

113 multiple-visit endodontic treatment; and the participants were asked to indicate their degree  
114 of agreement with the statements on a 3-point Likert scale (agree; neutral; disagree). Their  
115 year of clinical dental practice, use of magnification devices (magnifying loupes and  
116 microscope) and prevalence of single-visit and multiple-visit endodontic treatment was also  
117 asked.

118  
119 The data collected were entered into a personal computer and analysed with the software  
120 IBM SPSS Statistics 20.0. Chi-square tests were used to evaluate the differences in  
121 prevalence of single-visit endodontic treatment by the dentists using magnification and those  
122 without using magnification. The level of statistical significance was set at 0.05.

123

124

## 125 **Results**

126 A total of 8 endodontists and 429 GDPs returned their questionnaires and the response rate  
127 was 50% and 53.6%. Among these 429 GDPs, 25 (5.8%) did not perform endodontic  
128 treatment. For those GDPs performing endodontic treatment (n=404, 94.2%), their mean  
129 ( $\pm$ SD) years of practice was 15.3 $\pm$ 9.1 compare to 23.6 $\pm$ 4.8 for endodontists. The mean year  
130 ( $\pm$ SD) of practice of the 373 GDPs preferred multiple-visit endodontic treatment was 15.1  $\pm$   
131 9.2, which is significantly lower (p=0.048) than (19.3  $\pm$  7.6) of the 26 general dentists who  
132 preferred single-visit endodontic treatment. One endodontist (12.5%) and 20 (5.0%) GDPs  
133 performed single-visit and multiple-visit endodontic treatment equally. Most endodontists  
134 (n=7, 87.5%) and GDPs (n=375, 92.8%) predominantly performed multiple-visit treatment.  
135 Almost all endodontists (n=7, 87.5%) used surgical microscope for endodontic treatment  
136 compared with only 25 GDPs (6.2%) used. It was relatively more GDPs used magnifying  
137 loupes instead (n=123, 30.4%). There was 274 GDPs (67.8%) not using both magnifying

138 devices. Among the 123 GDPs who used magnifying loupe for endodontic treatment, 13  
139 preferred single-visit endodontic treatment. There were only 13 out of 265 the GDPs not  
140 using magnification preferred single-visit endodontic treatment. The difference is statistically  
141 significant (13/123 vs. 13/265,  $p=0.023$ )

142

### 143 **Reasons for choosing multiple-visit and single-visit treatment**

144 The commonest reasons of endodontists for choosing multiple-visit were positive effects of  
145 inter-appointment medications ( $n=3$ , 37.5%) and lengthy treatments can be shortened into  
146 several appointments ( $n=2$ , 25%). It was different to GDPs which the commonest reasons for  
147 GDPs were the tooth treated had doubtful prognosis ( $n=103$ , 25.5%) and allowing time for  
148 lessening of symptoms ( $n=93$ , 23.0%) (Figure 4).

149

150 While the commonest reasons of endodontists for choosing single-visit treatment were  
151 treatment can be completed in one visit ( $n=4$ , 50%), better recall of root canal morphology  
152 ( $n=3$ , 37.5%) and patient time constraint ( $n=1$ , 13%). It showed similar beliefs in GDPs  
153 which the commonest reasons of GDPs for choosing single-visit treatment were treatment can  
154 be completed in one visit ( $n=127$ , 31.4%), patient time constraint ( $n=74$ , 18.3%) and better  
155 recall of root canal morphology ( $n=45$ , 11.1%) (Figure 5).

156

157

### 158 **Discussion**

159 This survey was conducted to all 18 Hong Kong endodontists and a random sample of GDPs.  
160 A postal reminder was sent 4 weeks after sending out the questionnaire. The response rate  
161 was at least 50% for both the GDPs and endodontists, and it is considered satisfactory for an  
162 anonymous questionnaire survey (Evans 1991). To conduct a cost effective survey, a random

163 sample of 800 GDPs was selected due to the large number of registered GDPs in Hong Kong.  
164 Further increase the sample frame may incur cost and may not increase the validity of the  
165 survey results or affect the representativeness of the sample (Glidewell *et al.* 2012). Evans  
166 (1991) stated that the survey is better to be performed in random samples with high response  
167 rates rather than large non-random samples with low response rate (Evans 1991).

168

169 The questionnaires collected most of the common reasons why clinicians considered single-  
170 visit and multiple-visit endodontic treatment. This could be attributed to the thorough  
171 literature search performed to study the criteria for clinicians in choosing single-visit and  
172 multiple-visit endodontic treatment in the design of the questionnaire. The questionnaire was  
173 pilot tested to 10 dentists and feedbacks were collected before the main study. The one-page  
174 questionnaire contains close-ended questions which were asked were easily understood and  
175 quick to complete. This could contribute to the high response rate of this survey.

176

177 In this study, both GDPs and endodontists in Hong Kong preferred multiple-visit endodontic  
178 treatment. Majority of the GDPs and endodontists expressed neither single-visit nor multiple-  
179 visit would bring better success rate over the other. This finding was similar to other studies  
180 reported in Australia (Sathorn *et al.* 2009), Belgium (Slaus & Bottenberg 2002), Denmark  
181 (Bjorndal & Reit 2005), Japan (Inamoto *et al.* 2002) and U.S. (Calhoun & Landers 1982;  
182 Dastmalchi *et al.* 2011) although the training backgrounds could be different among  
183 countries. It was also common to find that most clinicians practiced multiple-visit endodontic  
184 treatment on their patients.

185

186 A survey performed in U.S. showed that majority patients' preference preferred single-visit  
187 (Vela *et al.* 2012). However, the survey reported that patients would accept multiple-visit if



188 the dentists could show the success rate superior than single-visit. There is so far no study in  
189 Hong Kong reported patients' preference on single-visit versus multiple-visit endodontic  
190 treatment. In general, patients tend to decide their treatment option after discussion with their  
191 dentist (Chu and Lo, 1999). Results of this study showed that patients' preference for  
192 multiple-visit treatment might not significantly affect clinicians' decision. The results in this  
193 study also showed majority of endodontists who had training on magnification utilized  
194 magnifying devices in performing endodontic treatment. Magnification was shown a factor  
195 that affected the efficiency and success rate of endodontic treatment (Wong et al., 2014).  
196 However, only about one third of GDPs in Hong Kong used magnification in their  
197 endodontic treatment. Continuing dental education should therefore be promoted to enhance  
198 dentists' skills and knowledge. This survey found more young GDPs preferred multiple-visit  
199 treatment. Further study can be performed to explore if this can be due to their level of  
200 competency and experience on endodontic treatment.

201

202 The most importance reason for choosing multiple-visit endodontic treatment by the GDPs  
203 was that "the tooth with doubtful prognosis can be assessed during treatment process". For  
204 the endodontist, multiple-visit endodontic treatment allowed time for lessening of symptoms  
205 before obturation. This study also found that endodontists showed more consistent on the  
206 reasons in choosing single- or multiple-visit endodontic treatment, whereas the GDPs showed  
207 more diversified in their reasons for the treatment. The results were similar to other studies  
208 (McCaul *et al.* 2001; Dechouniotis *et al.* 2010); and the phenomenon reflected on the effect  
209 of the similar specialist training among endodontists with most consistent agreement  
210 (Dechouniotis *et al.* 2010). The GDPs who provide comprehensive dental care may spend  
211 more time on the assessment for the factors affecting the outcome of the endodontic  
212 treatment. A common practice for GDPs is to decide on next stage of treatment planning

213 including extractions followed by replacement with prostheses. Most GDPs would refer their  
214 patients to endodontists (Wolcott & Terlap 2014) for treatment particularly on complex  
215 restorative cases (Messer 1999; Alani *et al.* 2011).

216

217 This study found most endodontists in Hong Kong preferred multiple-visit endodontic  
218 treatment. One of the main reasons could be that they need to manage complicated cases  
219 referred by the GDPs, These complicated cases often require lengthy treatments that could be  
220 uncomfortable to both the clinician and the patients. Therefore, they preferred dividing the  
221 treatment into several shorter appointments. On the contrary, the two most important reasons  
222 for choosing single-visit considered by both the endodontists and the GDPs was the treatment  
223 can be completed in one-visit and patient time constraint. The decisions on single-visit come  
224 with the influences by patients' factor. The clinicians would discuss with patients on  
225 treatment natures and consequences before finalized the treatment planning. This may  
226 increase the patients' confidences toward clinicians (Bornstein *et al.* 2000). Bornstein (2000)  
227 found that the patients' preferences towards clinicians related more on ease of getting  
228 appointment and flexible time. However, they considered little on neither dentists' age,  
229 gender, professional qualifications nor clinics' appearance.

230

231 The clinicians in Hong Kong generally agreed less on the multiple-visit treatments would  
232 bring along lesser pain and higher success rate. This finding was in agreement with the study  
233 by Raju *et al.* (2014). Some of the endodontists could believe the advantages of leaving inter-  
234 appointment medications dressed in root canals. Some studies showed that the effect of  
235 calcium hydroxide increase the success rate in multiple-visit (Silveira *et al.* 2007; Siqueira *et*  
236 *al.* 2007). Other studies showed the effects of calcium hydroxide cannot be over-weighted  
237 (De Moor 2003; Sathorn *et al.* 2007). One of the reasons to be considered to perform single-

238 visit treatment by endodontists and GDPs was single-visit treatment has a better recall of root  
239 canal morphology.

240

241 Previous studies reported lack of significant difference on the post-operative pain and success  
242 rate between multiple-visit and single-visit treatment (Figini *et al.* 2007; Wong *et al.* 2014).  
243 Since many dental schools taught multiple-visit endodontic treatment, it was not difficult to  
244 understand that most clinicians prefer the multiple-visit treatment. Once they develop this  
245 habit of practice, it may be difficult to change clinicians' practice performance just based on  
246 the methods published literatures and knowledge delivery by conferences. Davis (1995)  
247 stated that it may be more effective ways to change practice behaviour by practice-based and  
248 outreach visit interventions (Davis *et al.* 1995).

249

250 In this study, there was lack of information to explain the specific cases on the decision for  
251 single-visit and multiple-visit endodontic treatment. Clinicians tended to perform single-visit  
252 bases on different clinical aspects. Yap *et al.* (2014) recently reported that single-visit root  
253 canal treatments would be needed on special needs patients to retain their dentition (Yap *et al.*  
254 2014). This may have different reason to implement single-visit treatment. Further studies  
255 were suggested to investigate the criteria of performing single-visit versus multiple-visit  
256 endodontic treatment.

257

258

## 259 **Conclusion**

260 According to this survey, According to this survey, most Hong Kong endodontists and GDPs  
261 preferred offering multiple-visit endodontic treatment. The commonest reasons for their  
262 preference of single or multiple-visit endodontic treatment were similar.

263

264

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268

269

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331

**Endodontist's Perception of Single-visit and Multiple-visit Root Canal Treatment**

This survey aims to investigate the current practice of root canal treatment (RCT). There is no right or wrong answer to the questions below so please choose the answer that represents *your opinion*.

**Q1.** Are you currently practicing RCT?       Yes       No (End of survey. Thank you).

**Q2.** How are you currently practicing RCT?       Only single-visit  
 Only multiple-visit  
 Predominantly single-visit  
 Predominantly multiple-visit  
 Both single-visit and multiple-visit equally

**Q3.** What factors would you consider for multiple-visit RCT?      **Agree      Neutral      Disagree**

|   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| A. Lengthy treatments can be shortened into several appointments (e.g. curved canal, multiple canals) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Tooth with doubtful prognosis can be assessed during the treatment process                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Positive effects of inter-appointment medications dressed in root canal(s)                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Allow time for lessening of symptoms before obturation (e.g. pain, abscess)                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Reduction of post-operative pain   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. High success rate  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Easy collection of treatment fees for multiple visits  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| H. Dentists' preference/favourable previous experience  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I. Patients' preference/favourable previous experience  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| J. Patient time constraint  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| K. Dentist time constraint  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| L. Others (please specify): _____   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Q4.** Which factor above in Q3 would you consider the most important for you to do multiple-visit RCT?      \_\_\_\_\_  
(Put a letter from A to L).

**Q5.** Which factors would you consider for single-visit RCT?      **Agree      Neutral      Disagree**

|   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| A. Better recall of root canal morphology within same visit | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Lower risks and complications of local anesthetics       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Decreased instrumentation procedural errors              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Decreased material wastage                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Treatment can be completed in one visit                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. High success rate  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Dentists' preference/favourable previous experience      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| H. Patients' preference/favourable previous experience      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I. Patient time constraint                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| J. Dentist time constraint                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| K. Others (please specify): _____                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Q6.** Which factor above in Q5 would you consider the most important for you to do single-visit RCT?      \_\_\_\_\_  
(Put a letter from A to K).

**Q7.** Do you perform RCT using a magnifying loupe?       Yes       No

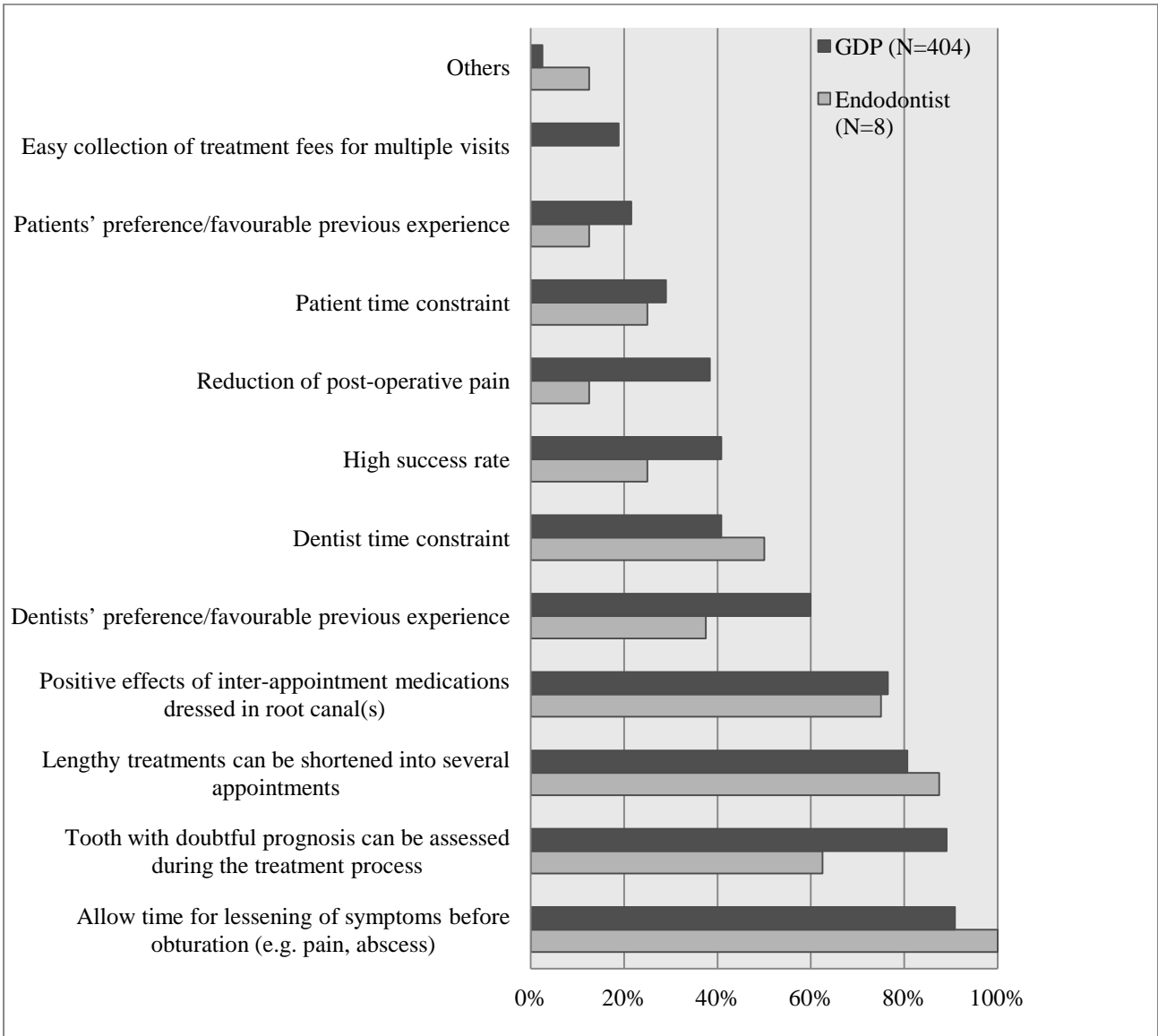
**Q8.** Do you perform RCT using a microscope?       Yes       No

**Q9.** In general, would you prefer multiple-visit or single-visit RCT?       Multiple-visit       Single-visit

**Q10.** How many years have you been practicing dentistry?      \_\_\_\_\_ years

**The End. Thank you.**

334 **Figure 2 Factors influencing the choice on multiple-visit endodontic treatment by GDPs**  
 335 **and endodontists in Hong Kong**  
 336



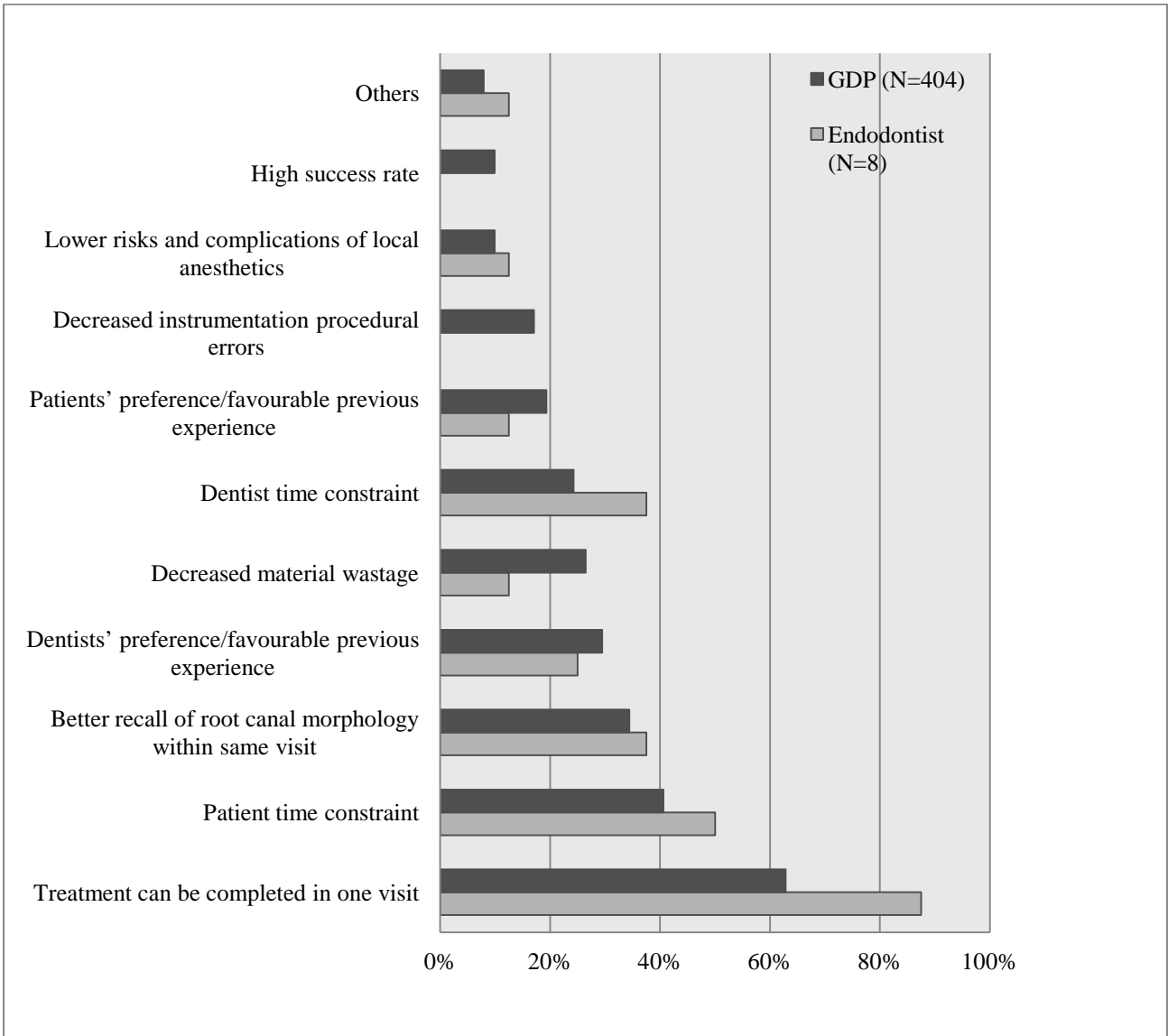
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338



339 **Figure 3 Factors influencing the choice on single-visit endodontic treatment by GDPs**  
 340 **and endodontists in Hong Kong**

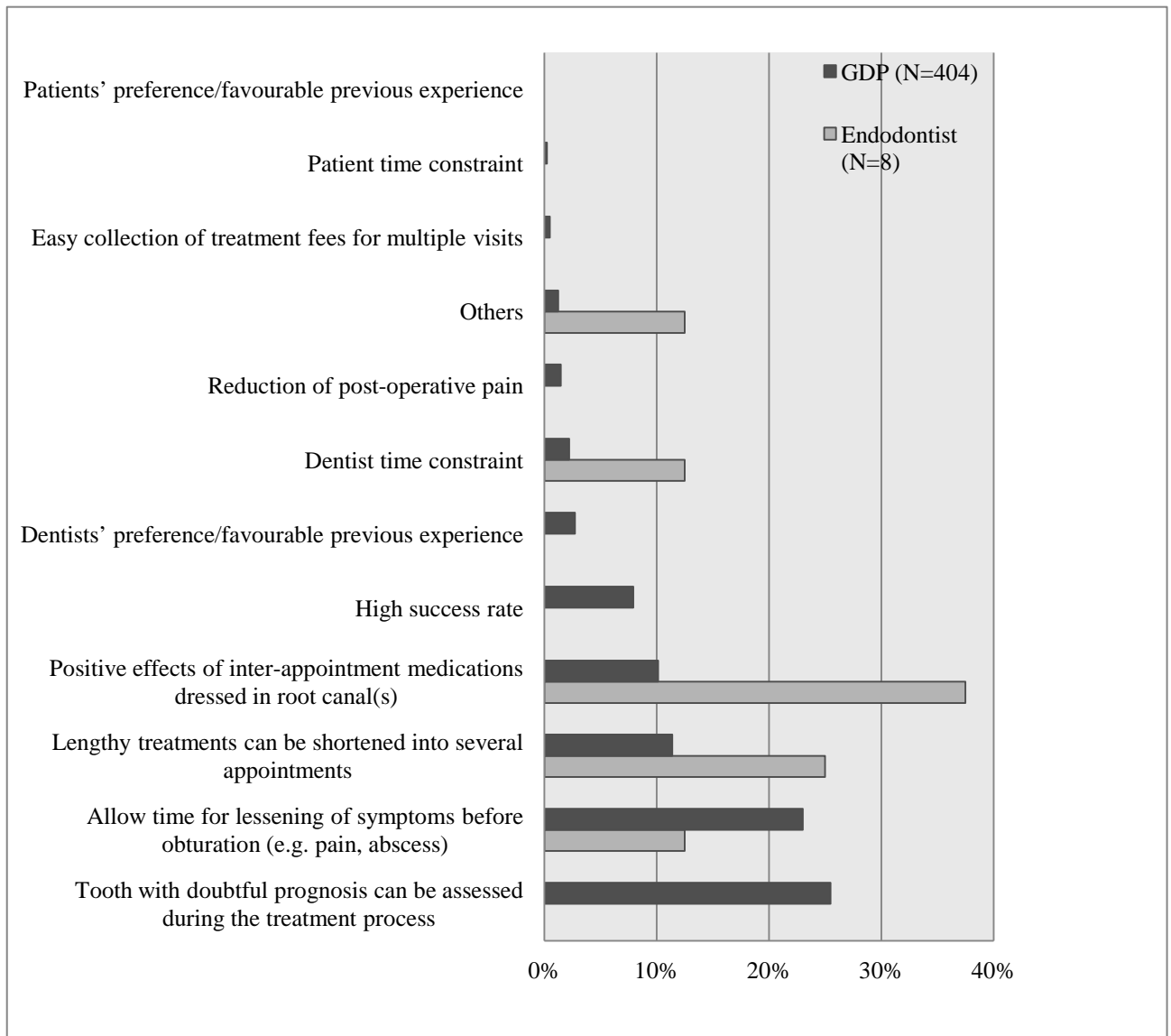
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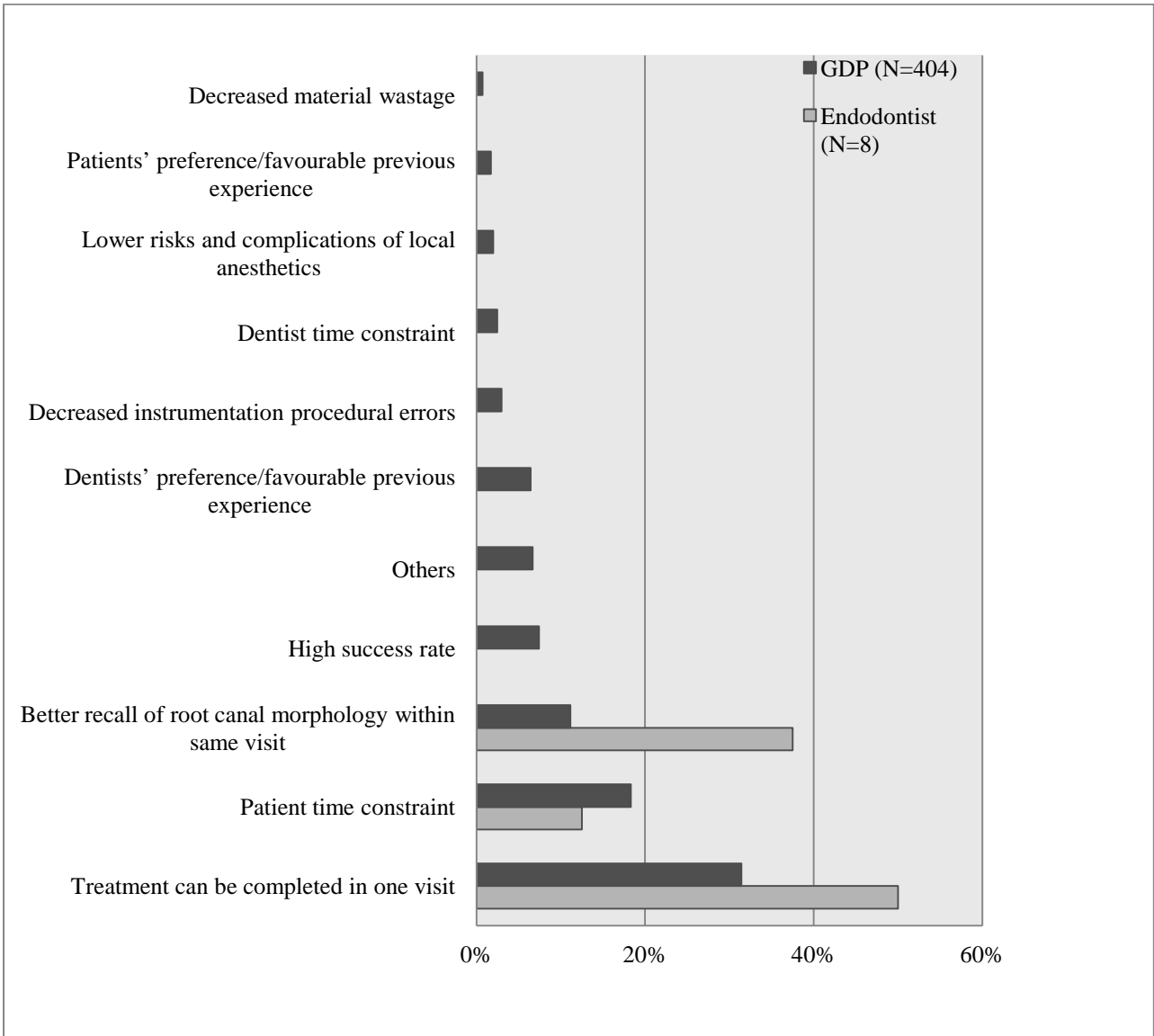
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344 **Figure 4 The most important factor to consider in multiple-visit endodontic treatment**  
 345 **by GDPs and endodontists in Hong Kong**  
 346



347 **Figure 5 The most important factor to consider in single-visit endodontic treatment by**  
 348 **GDPs and endodontists in Hong Kong**  
 349



350