"تقييم موقف وسلوك اختصاصيي مداواة الأسنان اللبية والممارسين العامين عند حدوث انفصال أدوات المعالجة اللبية"

نسيم بكر* أ.د. حسان الحلبية**

(الإيداع: 9 آذار 2021 ، القبول: 13 حزيران 2021)

الملخص:

يعد حصول انفصال إحدى أدوات المعالجة اللبية حادثة مزعجة خلال معالجة الأقنية الجذرية المحافظة، حيث تنقل الحالة إلى مستوى أكثر صعوبة مهما كانت حالتها قبل بدء المعالجة. إن الهدف من هذا البحث هو تقصي موقف وسلوك أطباء الأسنان العامين واختصاصيي المداواة اللبية تجاه الأدوات اللبية المنفصلة خلال إجراءات المعالجة. شمل حجم العينة 232 اختصاصي مداواة لبية وطبيب أسنان ممارس عام في سورية، وتكوَّن الاستبيان من 7 أسئلة حول الإجراءات المتخذة تجاه انفصال أدوات المعالجة اللبية، وأظهرت النتائج أن (87.06%) من المشاركين في الاستبيان قد تعرضوا لحصول انفصال إحدى أدوات المعالجة. كانت نسبة الحدوث أكبر لدى اختصاصيي المداواة البية (100%) مقارنةً بالممارسين العامين (82.75%). حصلت معظم حالات الانفصال في الأرحاء والأقنية المنحنية وخصوصاً في الثلث الذروي من هذه الأقنية. نجح (10.61%) من المشاركين في الاستبيان فقط في استخراج الأداة من القناة، بينما تمكن(38.93%) منهم من تجاوزها. تم تحليل المعطيات بعد جمع البيانات باستخدام تحليل كاي–مربع بمستوى دلالة 0.05.

الكلمات المفتاحية: معالجة الأقنية الجذرية، انفصال أدوات المعالجة اللبية، تجاوز ، استخراج، استبيان.

* طالب دراسات عليا (دكتوراه) – اختصاص مداواة الأسنان– كلية طب الأسنان – جامعة حماة.

** أستاذ في مداواة الأسنان– رئيس قسم مداواة الأسنان – عميد كلية طب الأسنان – جامعة حماة.

"Evaluation of Attitude and Practice of the Endodontists and General Practitioners towards Endodontic Instruments Separation"

Naseem Baker* **Prof. Dr Hassan Al Halabiah****

(Received: 9 March 2021 , Accepted: 13 June 2021)

Abstract:

Endodontic instrument separation is an unpleasant mishap, could take place during conservative root canal treatment. This event increases the treatment difficulty significantly. The aim of this research is to evaluate the attitude and practice of general dental practitioners and endodontists towards separated endodontic instruments during treatment procedures. The sample size comprised 232 endodontists and GDPs in Syria, the survey comprised 7 questions about attitude and practice towards endodontic instruments separation, the results showed (87.06%) of respondents had experienced separated instruments with a significantly higher proportion of endodontists (100%) compared with that of GDPs (82.75%), and overall (42.26%) of respondents experienced this problem more than three times. Most of this separations occurred in molars, curved canals and in the apical third of these canals. Only (10.61%) of respondents succeed in retrieval the instrument out of the canal, (38.93%) of them succeed in bypassing it. After collecting the responses data were analyzed using chi-square at the 0.05 level of significance.

Key-words: root canal treatment, endodontic instrument separation, bypass, retrieval, survey.

* Postgradguated student (PhD degree) – Department of Endodontic and Operative Dentistry – College of Dentistry.

**Professor in Endodontic and Operative Dentistry - Head of Endodontic and Operative Dentistry Department/ College of Dentistry – Dean of College of Dentistry - Hama University.

1-Introduction:

Endodontics as defined by the American Association of Endodontists (AAE) is: "The branch of dentistry concerned with the morphology, physiology and pathology of the human dental pulp and periradicular tissues." (Eleazer, p *et al.* 2017)

The first aim of endodontic treatment is to preserve the pulp vitality. However, when the injury exceeds the tolerance of the pulp, it requires polypectomy and cleaning and shaping. (Al Halabiah, H 2017)

Root canal treatment (RCT) may require the use of a variety of instruments including files, ultrasonic tips, explorers, irrigation needles, Lentulo spirals, spreaders, pluggers, heat-conducting tips, and many other instruments. (Lambrianidis, T 2017)

In spite of the metallurgical improvements in the design of the endodontic instruments, the separation of these instruments during canal preparation may still a big concern in the field of RCT, because when this problem happens, it transforms the case into a more difficult level, also it is the most common procedural accident that occurs with these instruments during clinical use. (Sattapan B, *et al.* 2000) (Martı´n B, *et al.* 2003) (Lambrianidis, T 2017)

A review in the literature revealed a prevalence of retained separated instruments between 0.7 and 7.2% in teeth undergoing RCTs. (Crump MC & Natkin E 1970) (Hülsmann M & Schinkel I 1999) (Spili P *et al.* 2005) (Iqbal MK *et al.*2006) (Parashos P & Messer HH 2006) (Cheung GS *et al.* 2007)

Although many last studies showed that good prognosis of the remaining separated instruments depends on bacterial microleakage prevention, and the obturation technique. (Al Halabiah, H 2018) (Spångberg L, 2001), the mishap of instrument separation (IS), is a frustrating situation for the clinician as it may prevent the access to the apex and most of the time impedes full length instrumentation, irrigation and obturation of the root canal. (Vouzara, T *et al.* 2018).

We have to keep in mind that the instruments that non-responding to retrieval or bypass attempts, don't result in necessarily endodontic treatment failure. Good prognosis of apical separated file linked to bacterial microleakage prevention, and the obturation technique of choice is thermal vertical condensation. (Al Halabiah, H 2018)

Although all the previous studies that discuss the incidence of endodontic instrument separation, it stills an area of uncertainty (Lambrianidis, T 2017), many studies have investigated the occurrence

and removal of fractured instruments and other associated factors. However, little information is available regarding the attitudes and practices of dental practitioners in Syria toward this problem.

The aim of this study was to investigate the attitudes and opinions of (endodontists, GDPs and other specialists) in Syria towards endodontic instrument separation, also will focus on aspects of the management of this problem.

2-Materials and methods:

In the initial stage of this study, a pilot survey had been made to make sure that all questions are understandable (including: 10 endodontists and 10 general dental practitioners (GDPs)).

Then the survey was carried out during 7 days involving 232:

- Group 1: 58 endodontists.
- Group 2: 174 GDPs and other specialists.

The survey involving 9 questions: (6 multi choice questions, 3 close ended questions), about attitude and practice of the endodontists and general practitioners towards endodontic instruments separation.

Survey studies can provide information about the knowledge, attitudes, preferences, opinions, experiences, practices and demographics of participants. (Fink A, 1995)

After collecting the responses, data were entered into SPSS 14 (SPSS Inc., Chicago, IL, USA). They were analyzed using **Chi-Square** tests at the 0.05 level of significance.

3-Results:

Daily practice of endodontic:

The vast majority of respondents 228 (97.41%) do RCTs as a daily work in their clinics or colleges. Whereas only 6 (2.69%) of respondents do not do RCT and they are all GDPs or other specialists. All endodontists (100%) treat endodontic cases in their clinics as daily practice.

Using of rotary file systems reusing

A total of (53.2%) of respondents use rotary file systems for root canal preparation whereas (46.8%) do not. A significantly higher proportion of endodontists (100%) use rotary file systems compared with that of GDPs and other specialists (51.64%)

Also the vast majority of respondents (92.2%) sterilize and reuse the endodontic instruments for more than one case, whereas the minority (7.8%) use endodontic instruments for only one case and do not reuse them.

Experience of instrument separation during RCTs:

A key question in this survey was whether or not participants had experienced endodontic instruments separation.

A total of 202 (87.06%) of respondents to the close ended question had experienced this problem. A significantly clearly higher proportion of endodontists (100%) had experienced this problem compared with GDPs or other specialists 144 (82.75%).

So a total of 30 (12.94%) who had never experienced this problem are all GDPs or other specialists.

Rate of instrument separated:

The answers of this multi choice question ***(how many times have you experienced separated instrument problem during your RCT practicing?)*** are:

(Never, one time, two times, three times, more than that)

A total of (42.26%) of respondents experienced IS for more than 3 times, significantly higher than other answers (1, 2, 3 times), the answers were (24%, 14.3%, 6.5%) respectively.

Table 1: Rate of instrument Separation:

Times of instrument separation	0	1	2	3	more
Percentage of respondents %	%12.94	%24	%14.3	%6.5	%42.26

Type of the tooth:

The vast majority of respondents experienced this problem in molars more than premolars and anterior teeth as following (84.8%, 1.3%, and 1.3%).

Whereas (12.6%) of them experienced this problem in more than one group of teeth.

Straight vs curved canal:

The majority of respondents experienced this problem in curved canals (88.7%), whereas only (2%) of them say it was in straight canal (2%), also (9.3%) Both curved and straight canals.

Table 2: Distribution of instrument separation according to canal curvature:

Type of canal	Curved	Straight	Both
Percentage of respondents %	88.7%	2%	9.3%

The third of canal:

The majority of respondents experienced this problem in the apical third (67.2%).

Whereas (32.3%) were in the middle third and only (0.5%) in the coronal third.

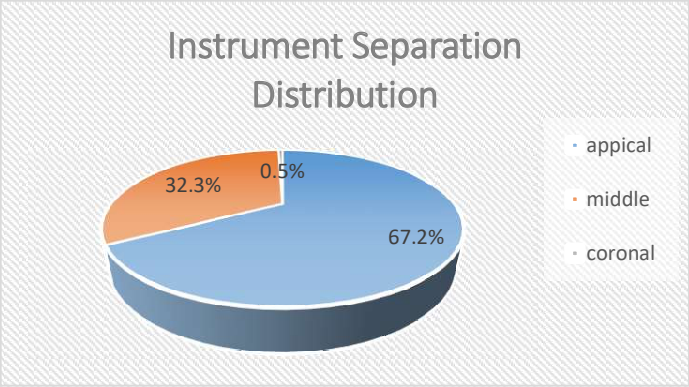

Fig. 1: Instrument separation distribution according to the canal third

The management of the separated instrument:

Overall (38.93%) of respondents who experienced this problem succeed in bypassing the separation instrument and continued treatment.

Whereas (10.61%) of them succeed in retrieval the instrument out of the canal.

(22.12%) left the instrument after the failure to deal with it.

(7.14%) of GDPs Refer the case to an endodontist immediately.

(27.38%) of GDPs Refer the case to an endodontist after the failure to deal with it.

(3.57%) of GDPs had no special acting and continued treatment without.

Table 3: Management of instruments separated in the root canal

Management type	GDPs	Endodontists	Total
Bypass	30.95%	62.06%	38.93%
Retrieve	7.14%	20.68%	10.61%
Leave after	23.8%	17.24%	22.12%
Refer to a specialist immediately	7.14%	-	7.14%
Refer to a specialist after trying	27.38%	-	27.38%
No special act	3.57%	-	3.57%
Total	100%	100%	100%

4-Discussion:

Improvements in endodontic instrument alloy, design and instrumentation techniques have accelerated over the last few decades. However, separation of these instruments remains a main problem and could occurs suddenly and unexpectedly during root canal preparation (Hülsmann M & Schinkel I 1999). Although many studies have discussed this issue (Hülsmann M & Schinkel I 1999) (Parashos P & Messer HH 2004) (Spili P *et al.* 2005), little is known about attitudes and opinions of dental practitioners (Barbakow F & Lutz F 1997) (Parashos P & Messer HH 2004). Survey study is a research tool that provides information about opinions, attitudes and behavior of respondents. (Lydeard S, 1991). However, it is known that such a research tool should involve not only a carefully planned and prepared set of questions and a well representative sample size, but also optimize response rates. (Lydeard S, 1991)

The results of our study agree with the study of (Parashos & Messer, 2004) showing that endodontists in Australia use rotary file systems more than GDPs but in different proportion. They showed that 22% of GDPs and 64% of endodontists use rotary file systems, whereas in our survey 100% of endodontists and 51.64% of GDPs and other specialists, as the rotary systems became more popular during the last few years between dentists in Syria. Resembling study in the UK showed that 92.6% of the endodontists and 65% of the GDPs use rotary file systems.

The most common pattern of endodontic instruments disposal was to sterile and reuse them several times before discarding (92.2%) whatever the type of the instrument, whereas the minority (7.8%) use endodontic instruments for only one case and do not reuse them and they are all endodontists. This proportion suggests the need to encourage dentists not to follow this pattern of use in order to decrease the incidence of instrument separation, as it is very difficult to precis a number of clinical use for each endodontic instrument, so a single use was recommended. (Arens FC *et al.* 2003)

The majority of respondents (87.06%) had experienced endodontic instrument separation. This might be explained by the fact that respondents were asked if they have experienced instrument separation during their practice without asking about the period of time.

A significantly higher proportion of endodontists (100%) had experienced instrument separation compared with GDPs (82.75%) especially who had experienced this more than 3 times, and this might be explained by the fact that endodontists perform more RCTs than GDPs and other specialists, the high rate of difficult referral cases that endodontists treat and because of the use of rotary file systems by endodontists more than other dentists as we found.

The results also showed that the rate of separation in molars is significantly higher than premolars and anterior teeth, this might be because of the anatomical variety and complexity in molars compering with other types of teeth, and this agreed with the study of (Iqbal *et al.* 2006) regarding endodontics graduate program at the University of Pennsylvania, as they found that 88.8% of the separation instruments were in molars.

As founded by (Iqbal et al. 2006), the incidence of instrument separation varies between apical third of root canals (82.7%) and (14.8%, 2.5%) for middle and coronal third respectively. In this context, we found that the separation rate varies from (67.2% to 32.8%) for apical and middle third respectively.

Interestingly, only 38.93% of the respondents succeed in bypassing the separation part of the instrument, so it is important to encourage dentists to learn this method, because most separation instruments can be bypassed in reasonable time without using complicated devices, especially when it is localized before curvature, so the success rate will be in a high level up to 68%, (Hulsmaun & Shinkle, 1999), or 87% (Suter et al. 2005). In this context, (27.38%) of GDPs referred the case to an endodontist after failure to deal with, whereas a small minority (7.14%) referred the case to an endodontist immediately. (10.61%) of cases was resolved by retrieval the instrument out of the canal only by endodontists, since retrieval process require special devices, used usually by them. Only 3.57% of GDPs had no special act towards IS.

5-Conclusion:

The majority of endodontists, GDPs and other specialists experienced the separation of endodontic instruments during root canal treatment as daily practice especially in the apical third of curved canals. However, the minority of GDPs and other specialists refer these cases to endodontists.

This study suggests emphasizing the maximum benefits of interdisciplinary care and the necessity to learn bypass technique to deal with IS since it is considerable as non-invasive technique and requires minimum tools, with considerable rate of success.

We hope that our study will serve as a base for future studies on the practice of specialist and GDPs to reduce common complications in daily practice of endodontics.

Further work needs to be done to establish whether the attitude and practice of the endodontists and GDPs improve or not during daily practice.

6-Acknowledgments:

The authors wish to thank all participants for their responses in this survey.

7-References:

1. Al Halabiah, H. Effect of Endodontic Instrument Tip Fracture on Apical Sealing of Obturated Root Canal: In Vitro and Retrospective Clinical and Radiological Study. Journal of Hama University, 2018, 1(7) 15.
2. Al Halabiah, H. Hama University Publications. Hama, Syria. Endodontic 1. 2017. (2)
3. Arens FC, Hoen MM, Steiman HR, Dietz GC Jr (2003) Evaluation of single-use rotary nickel–titanium instruments. Journal of Endodontics 29, 664–6.
4. Barbakow F, Lutz F (1997) The 'Lightspeed' preparationtechnique evaluated by Swiss clinicians after attendingcontinuing education courses. International Endodontic Journal 30, 46–50.
5. Cheung GS, Bian Z, Shen Y, Peng B, Darvell BW. Comparison of defects in ProTaper hand-operated and engine-driven instruments after clinical use. Int Endod J. 2007; 40(3):169–78.
6. Crump MC, Natkin E. Relationship of broken root canal instruments to endodontic case prognosis: a clinical investigation. J Am Dent Assoc. 1970; 80(6):1341–7.
7. Eleazer, P., Glickman, G., & McClanahan, S. (2017). American Association of Endodontists. Clinical Resources. AAE Glossary of Endodontic Terms.
8. Fink A (1995) How to Ask Survey Questions. London: SAGE publications Ltd.
9. Hülsmann M, Schinkel I. Influence of several factors on the success or failure of removal of fractured instruments from the root canal. Endod Dent Traumatol. 1999; 15(6):252–8.
10. Iqbal MK, Kohli MR, Kim JS. A retrospective clinical study of incidence of root canal instrument separation in an endodontics graduate program: a PennEndo database study. J Endod. 2006; 32(11):1048–52.
11. Lambrianidis, T. (Ed.). (2017). Management of Fractured Endodontic Instruments: A Clinical Guide. Springer.
12. Lydeard S (1991). The questionnaire as a research tool. Family Practice 8, 84–91.
13. Martı´n B, Zelada G, Varela P, et al. (2003) Factors influencing the fracture of nickel–titanium rotary instruments. International Endodontic Journal 36, 262–6.
14. Parashos P, Messer HH. Rotary NiTi instrument fracture and its consequences. J Endod. 2006; 32(11):1031–43.

15. Parashos P, Messer HH (2004) Questionnaire survey on the use of rotary nickel–titanium endodontic instruments by Australian dentists. International Endodontic Journal 37,249–59.
16. Sattapan B, Nervo GJ, Palamara JEA, Messer HH (2000) Defects in rotary nickel–titanium files after clinical use. Journal of Endodontics 26, 161–5.
17. Spångberg L. The wonderful world of rotary root canal preparation. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001; 92:479.
18. Spili P, Parashos P, Messer HH. The impact of instrument fracture on outcome of endodontic treatment. J Endod. 2005; 31(12):845–50.
19. Suter B, lussia, sequeira: probability of removing fractured instruments from root canal: Int Endod J 2005; 38 (2): 118-23.
20. Vouzara, T., el Chares, M., & Lyroudia, K. (2018). Separated instrument in endodontics: Frequency, treatment and prognosis. Balkan Journal of Dental Medicine, 22(3), 123-132.