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Choice of grafting options post apicectomy procedure by specialist endodontist: An original research

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Abstract--Aim: The purpose of the present study was to evaluate the choice of grafting options post apicectomy procedure by various endodontists. Methodology: In the present descriptive survey, 8 questions were asked from 50 Endodontists, regarding the treatment options in cases of periapical pathologies as well as graft material preference after the apicoectomy procedure was performed. They were

asked for usability, economics, long term healing of periapical region related with post apicoectomy graft placement. Results: 49.5% of participants preferred calcium hydroxyapatite as a graft material as compared to bone granules or PRP. It was also noted that radiographic resolution and improved trabecular pattern in peri-radicular area was the most important aspect that endodontists look into while looking at healing of periapical lesion (1.43 ± 1.002). Most stable graft according to 61% of participants were autologous transplants- bone granules as well as calcium hydroxyapatite (1.422 ± 1.02). Conclusion: Endodontists preferred calcium hydroxyapatite or bone grafts, which has more stable long-term results.

Keywords--apicoectomy, bone graft, platelet rich plasma, healing.

Introduction

Apical surgery is the standard endodontic surgical procedure to maintain a tooth with significant periapical lesion that cannot be treated with conventional endodontic retreatment.¹ When any non-surgical or conventional endodontic treatment fails, apical surgery or apicoectomy is the procedure which is mostly conducted as retreatment. The most adopted surgical methods to solve any endodontic failures, accidents and complications of any conventional treatment are: curettage with periapical planning, apicoectomy, apicoectomy with retro-filling, apicoectomy with retro-instrumentation and canal retrofilling and filling simultaneous to surgery.² Apicoectomy involves the surgical removal of tooth root apex or root end resection which can be done alone or in combination with placing a retrograde filling in order to seal the apical part of the root.³ In the year 1884, apicoectomy procedure was well described and defined by J. Farrar⁴ as “a bold act, which removes the entire cause [of disease] and which will lead to a permanent cure which may not be the best in the end, but the most humane.”

According to Black,⁵ the root-resection technique i.e. amputation of the root apex has been originated as a treatment for “pyorrhea. alveolaris” complicated by a dental abscess in the late years of the 19th century as a valid alternative to a dental extraction. Apicoectomy (root resection or root amputation) signifies the removal of the apices of pulpless teeth in which satisfactory root or pulp canal therapy has been performed. This operation is performed to remove known or unknown infection, granulation tissue or cystic areas that involve these teeth; yet retaining the major portion of the roots in situ.⁶ Thus, the success relies on different factors and is verified through clinical and radiographic evaluations during follow up.⁷⁻⁹ Bone loss due to periapical pathology is a common presentation encountered in clinical practice. There is ample evidence that this endodontically induced periradicular bone loss resolves spontaneously after a successful endodontic treatment, especially in cases of periapical abscess and pocket cysts.¹⁰⁻¹² Adjuvant use of biocompatible materials like mineral trioxide aggregate (MTA)¹³ or calcium hydroxide¹⁴ can aid in this healing process.

Some periapical lesions like true cysts may not heal spontaneously after endodontic therapy and may require a surgical intervention in the form of

apicoectomy. Surgical intervention may also be required in cases of endodontic mishaps such as perforation or instrument separation. Numerous bone grafts and membranes have been used to surgically manage bone defects with varying success, but the benefit of using a bone graft and guided tissue regeneration (GTR) membranes in periapical surgery is unclear.¹⁵ Furthermore, the choice of a graft or membrane is influenced by many variables, such as availability, cost, and patient's consent, among others. There is also an added risk of graft infection, loss of graft, wound dehiscence, or membrane exposure during healing.¹⁶ Platelet-rich fibrin (PRF) has gained wide acceptance as a grafting material since its introduction by Choukroun in 2001 due to its beneficial effects in wound healing.¹⁷

Ease of preparation and the relative lack of complications has made PRF a very safe and popular biomaterial leading to widespread use in regenerative procedures.¹⁸ The bone regeneration following periapical surgery can be facilitated by placing bone graft into the periapical defect. Different types of bone grafts are available for dental surgical procedure. These include autografts, allografts, xenografts, and alloplasts. The ideal bone replacement material should be clinically and biologically inert, noncarcinogenic, easily maneuverable to suit the osseous defect, and should be dimensionally stable. It should serve as a scaffold for bone formation and slowly resorb to permit replacement by new bone. Calcium-based ceramic materials like calcium hydroxyapatite (HA) and tricalcium phosphate (TCP) had been used popularly for alveolar ridge reconstruction and in periodontal bony defects.¹⁹

Aim of the present study

The purpose of the present study was to evaluate the choice of grafting options post apicoectomy procedure amongst various endodontists.

Methodology

A questionnaire survey was conducted amongst 50 endodontists who has more than 5 years of clinical experience. Out of 50, around 15 were female specialists and age variation from 30-50 years. The survey was formatted in an open-ended format in English language and were emailed to the participants. 8 questions were asked regarding the treatment options in cases of periapical pathologies as well as graft material preference after the apicoectomy procedure was performed. They were asked for usability, economics, long term healing of periapical region related with post apicoectomy graft placement. (Table 1) The data was entered in MS excel spreadsheet and then subjected to statistical analysis using SPSS 25.0. Descriptive statistical analysis was carried out using standard deviation, mean etc. The result was considered statistically significant when p value was <0.05.

Results

The survey data showed that mean age of endodontists was 39 years. It was observed that around 73% of endodontists get periapical surgery cases once a week (1.78 ± 0.92) which was significant ($p=0.03$). 49.5% of participants preferred calcium hydroxyapatite as a graft material as compared to bone granules or PRP.

It was also noted that radiographic resolution and improved trabecular pattern in peri-radicular area was the most important aspect that endodontists look into while looking at healing of periapical lesion (1.43 ± 1.002). Most stable graft according to 61% of participants were autologous transplants- bone granules as well as calcium hydroxyapatite (1.422 ± 1.02). Most endodontists followed up their endodontic surgical patients once within 6 months (1.027 ± 0.23). (Table 2)

Discussion

Conservative endodontic treatment or non-surgical root canal treatment has a success rate between 53% and 98%, while retreatment cases have lower reported success rates.²⁰ The failure of an endodontic treatment is often attributed to either inadequate cleaning and disinfection of the root canal space during the first root canal therapy, or recontamination, due to coronal leakage.²¹ Apicoectomy is a surgical procedure that requires incision, root resection, root-end cavity preparation associated with a retrograde/root-end filling and closure.²² Apicoectomy is one of the most used surgical treatments in endodontics, because it can prevent tooth extraction, by eliminating the pathological tissues around the apical third of the root.²³ Also, there are several types of dental materials that can be used as a root-end filling, in order to seal the apical surface, each having its advantages and disadvantages.²² Regarding apical filling materials, a number of biocompatible materials have been introduced like MTA, Super EBA, and IRM. Nowadays, Guided tissue regeneration (GTR) techniques have also been projected as an adjunct with the intention to promote healing after periapical surgery.²³ PRF has an excellent track record as a biomaterial that encourages healing. Numerous applications of PRF have been described, ranging from implant-site grafting to wound healing.²⁴ Factors leading to the popularity of this grafting material are the relative ease of obtaining it and the absence of risks, such as rejection or allergy. Introduction of alloplastic materials, allografts, or xenografts at these periapical sites may have introduced an added risk of infection. PRF, being an autologous fibrin scaffold, does not carry this risk. Many variants of platelet concentrates have now come into use. These include pure platelet-rich plasma (P-PRP) and leukocyte- and platelet-rich fibrin (L-PRF), among others.²⁵ The efficacy of all these materials and their superiority to conventional graft materials still remains to be proven.²⁴

The relative lack of mechanical strength and fast rate of absorption are factors that limit the therapeutic usage of PRF to applications in early wound healing and clot stabilization. The ultimate goal of periapical surgery is the predictable regeneration of periapical tissues, including the complete repair of the osseous defects. Inadequate bone healing is caused by ingrowth of connective tissue into the bone space, preventing osteogenesis. In order to prevent this soft-tissue ingrowth, bone grafts can be used to fill the bony space in case of large bony defects. Because with the evidence of early osseous healing subsequent orthodontic and prosthodontics treatment can be readily performed. Even though PRF had faster healing capacity, still the dentists preferred calcium hydroxyapatite or bone grafts, which has more stable long-term results.

Conclusion

The present study highlighted the knowledge of various grafts used in periapical healing post apicoectomy procedure, which is essential for tooth support and overall stability. Endodontists were in unison for the usage of bone graft materials for healing peri- radicular area.

References

1. Barnett JD, Mellonig JT, Gray JL, Towle HJ. Comparison of freeze dried bone allograft and porous HA in human periodontal defects. *J Periodontol*. 1989;60:231-7.
2. Black CV. Amputation of the roots of teeth. In: Litch WF, editor. *The American system of dentistry*. Philadelphia: Lea Brothers; 1886. pp. 990-2.
3. Caliskan MK. Prognosis of large cyst-like periapical lesions following nonsurgical root canal treatment: A clinical review. *Int Endod J* 2004;37:408-416.
4. Darmadi, N. M., Edi, D. G. S., Kawan, I. M., Semariyani, A. A. M., & Sudiarta, I. W. (2018). The changes in protein content, moisture content, and organoleptic pindang of auxis thazard due to re-boiling stored in cold temperatures. *International Journal of Life Sciences*, 2(3), 75-85. <https://doi.org/10.29332/ijls.v2n3.210>
5. Dohan DM, Choukroun J, Diss A, et al. Platelet-rich fibrin (PRF): A second generation platelet concentrate. Part I: Technological concepts and evolution. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:e37-e44.
6. Dohan Ehrenfest DM, Rasmusson L, Albrektsson T. Classification of platelet concentrates: From pure platelet rich plasma (P-PRP) to leucocyte- and platelet-rich fibrin (L-PRF). *Trends Biotechnol* 2009;27:158-167.
7. el-Swiah JM, Walker RT. Reasons for apicectomies. A retrospective study. *Endod Dent Traumatol* 1996;12(4):185- 91.
8. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J* 2006;39(12):921-30.
9. Gulie Kui A, Berar A, Lascu L, Bolfa P, Bosca B, Miha C, et al. The influence of root-end filling materials on bone healing – an experimental study. *Clujul Med*. 2014;87(4):263-268.
10. Katsamakidis S, Slot DE, Van der Sluis LW, Van der Weijden F. Histological responses of the periodontium to MTA: A systematic review. *J Clin Periodontol* 2013;40:334-344.
11. Laurence B. General dentists, endodontists, and other dental specialists make different treatment recommendations depending on dental specialty status when presented with varying clinical scenarios involving endodontically involved teeth. *J Evid Based Dent Pract*. 2009;9:93-94.
12. Li J, Wang HL. Common implant-related advanced bone grafting complications: Classification, etiology, and management. *Implant Dent* 2008;17:389-401.
13. Lin L, Chen MY, Ricucci D, Rosenberg PA. Guided tissue regeneration in periapical surgery. *J Endod* 2010;36: 618-625.

14. Locurcio LL, Leeson R. A case of periradicular surgery: apicoectomy and obturation of the apex, a bold act. *Stomatological Dis Sci* 2017;1:76-80.
15. Maalouf EM, Gutmann JL. Biological perspectives on the non-surgical endodontic management of periradicular pathosis. *Int Endod J* 1994;27:154–162.
16. Miron RJ, Zucchelli G, Pikos MA, et al. Use of platelet-rich fibrin in regenerative dentistry: A systematic review. *Clin Oral Investig* 2017;21:1913–1927.
17. Miron RJ, Zucchelli G, Pikos MA, et al. Use of platelet-rich fibrin in regenerative dentistry: A systematic review. *Clin Oral Investig* 2017;21:1913–1927.
18. Nair PN, Pajarola G, Schroeder HE. Types and incidence of human periapical lesions obtained with extracted teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996;81:93- 102.
19. Nair PN, Sjögren U, Krey G, Sundqvist G. Therapy-resistant foreign body giant cell granuloma at the periapex of a rootfilled human tooth. *J Endod* 1990;16:589-95.
20. Nair PN. Cholesterol as an aetiological agent in endodontic failures: a review. *Aust Endod J* 1999;25:19-26.
21. Nasseh AA, Brave D. Apicoectomy: The Misunderstood Surgical Procedure. *Dent Today*. 2015;34(2), 130, 132, 134–136.
22. Orso VA, Filho MS. Cirurgia Parendodôntica: quando e como fazer. *R. Fac Odontol Porto Alegre Porto Alegre* 2006;47(1):20-3.
23. Ramachandran Nair PN. Non-microbial etiology: Periapical cysts sustain posttreatment apical periodontitis. *Endod Topics* 2003;6:96–113.
24. Santos Soares SM, Brito-Júnior M, de Souza FK, et al. Management of cystlike periapical lesions by orthograde decompression and long-term calcium hydroxide/chlorhexidine intracanal dressing: A case series. *J Endod* 2016; 42:1135–1141.
25. Seldin SD. Apicoectomy. *Am J Orthod* 1947;33(4):301-8.
26. Sugito, S., Agung, A. A. G., Yudana, I. M., & Ariawan, I. P. W. (2022). Digital testing application in knowing the effect of servant leadership and work motivation on teacher performance. *International Journal of Health Sciences*, 6(2), 682–698. <https://doi.org/10.53730/ijhs.v6n2.7583>
27. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. *International Journal of Health Sciences*, 5(2), vi-ix. <https://doi.org/10.53730/ijhs.v5n2.2937>
28. Tsesis I, Rosen E, Tamse A, Taschieri S, Del Fabbro M. Effect of guided tissue regeneration on the outcome of surgical endodontic treatment: a systematic review and meta-analysis. *J Endod* 2011;37(8):1039-45.
29. von Arx T. Apical surgery: A review of current techniques and outcome. *Saudi Dent J*. 2011;23(1):9–15.

Tables

Table 1
Questionnaire of the present research

S.No.	Questions
1	How frequently do you perform peri-apical surgeries?

2	Which graft material you are most comfortable to heal periapical area post-apicoectomy surgeries?
3	What all do you see for a healing process after graft placement?
4	Have you ever used PRP as a graft material?
5	Which is the most cost effective graft material according to you?
6	Have you ever faced graft failure in post-apicoectomy cases?
7	Which is the most stable graft material according to you?
8	How frequently do you evaluate radiographically the healing process?

Table 2
Quantitative data observed in the present research

Q. No.	Mean \pm SD	P value
1	1.78 \pm 0.92	0.03
2	Calcium hydroxyapatite- 1.63 \pm 0.87 Autograft-bone- 2.01 \pm 1.10 PRP-3.12 \pm 2.19	0.025
3	No swelling-2.11 \pm 1.66 Radiographic resolution- 1.43 \pm 1.002 Sinus healing-3.13 \pm 2.78 Proper mastication-1.98 \pm 1.53	0.106
4	Yes-3.76 \pm 3.01 No-1.78 \pm 1.12	0.9
5	1.73 \pm 1.04	0.06
6	Yes- 3.19 \pm 2.91 No-1.56 \pm 0.56	0.23
7	Bone grafts-1.422 \pm 1.02 Other than bone grafts- 3.69 \pm 3.01	0.81
8	Less than 6 months- 1.027 \pm 0.23 More than 6 months-3.99 \pm 3.05	0.043