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Review Article

Techniques for Atraumatic Extractions: A narrative review

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ABSTRACT:
Background: Extraction done atraumatically is crucial for the preservation of oral soft and hard tissues so as to minimize trauma to surrounding tissues and maintain maximal bone to benefit a potential implant site. Traditionally, extraction techniques have involved the use of luxators and elevators to enlarge the alveolar socket so as to deliver the tooth. This limits the success of immediate implant placement as the proportion of the socket change. Furthermore, following tooth loss the alveolar bone resorbs, bringing changes to bone height and width. This may impact prosthetic rehabilitation using implants. The use of atraumatic techniques limits the post-operative complications which decreases the chances of an exaggerated bone resorption. Various approaches exist to achieve this target and this article reviews some of the more popular and effective techniques currently used by clinicians. **Objective:** To review various techniques for atraumatic extraction used in implantology. **Methodology:** Studies reporting on minimally invasive extraction techniques were identified from the electronic databases such as PubMed, Google Scholar, for original research articles for review of various techniques. **Conclusion:** This study highlights the impact of various atraumatic techniques that may help reduce post extraction discomfort and preserve the periodontium for insertion of implant.
Key Words: dental implants; oral surgery; osseointegration; tooth extraction

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INTRODUCTION

Implants are a tried and tested modality of treatment that has gained great popularity for the treatment of edentulous spaces. After loss, if teeth are not replaced immediately, bone volume and height decreases rapidly by active resorption. [1, 2] Alveolar bone loss of around 1.5-2 mm vertically and up to 3.8 mm horizontally takes place within the first six months after tooth loss. [3, 4]

If no treatment is provided, then bone loss continues to occur and 60% of total ridge volume can be lost in the first three years. [5, 6] Conventional implants require a period of 3-6 months post operatively to osseointegrate and a subsequent surgery for the exposure of implant and confirmation of its anchorage in bone. [7]

Immediate implant placement has helped to mitigate these issues by reducing the number of surgical treatments required, a cutback of the time between extraction and the definitive prosthetic restoration, prevention of bone resorption, and conserving the alveolar ridge in anatomic proportion, which in turn has esthetic and functional benefits. [8]

This technique being comprehensively being used has led to the development of various atraumatic techniques so that better treatment outcomes can be achieved for the patient as well as the for the clinician. Most minimally invasive methods depend on exertion of forces to the periodontal ligament of the tooth. This, in turn, creates hyaluronic acid buildup in the periodontal ligament space. It allows the dissolution of the periodontal ligament and supports a hydraulic pressure release in the socket. Standard extraction movements can then be performed to deliver the

tooth.[9]

CONVENTIONAL TECHNIQUES FOR ATRAUMATIC EXTRACTIONS

USE OF PERIOTOME FOR ATRAUMATIC EXTRACTION

A recent study was done, in which a Periotome was used to nonsurgically deliver single rooted teeth. The study reported the use of Amron Periotome with blade attachments, detaching the gingival fibers and advancing into the PDL space, then tooth was extracted using extraction forceps. Minimal lacerations to soft tissue and preservation of thin alveolar plates were achieved while removing firm teeth and retained roots. Both immediate and delayed implant placements can benefit from the supportive environment provided by this instrument. [10]

Teeth could be removed in the presence of buccal cortical plate fractures and apical third root fractures without flap reflection and bone exposure. This leaves the shape of the extracted socket undisturbed and alveolus intact. It also reduced the duration of surgery, frequency and number of analgesics consumed, pain reduction and gingival laceration. [10]

NEWER TECHNIQUES USING STANDARD ARMAMENTARIUM: THE "BUTTON SEWING" TECHNIQUE

In this a slow-speed handpiece or implant handpiece is used with a long-shaft, small round bur. Some call it a "sewing" technique. Holes are poked around the tooth while progressively sliding down the root surface all around the tooth about 4.0 to 5.0 mm in depth (this area has the highest density of PDL fibers). This disrupts the PDL space, reduces hydraulic pressure, increases hyaluronic acid buildup, and allows for an estimated 40% to 50% reduction in extraction trauma.[9]

THE "WIGGLE AND WAIT" TECHNIQUE

This technique also leverages the buildup of hyaluronic acid because the tooth is placed under continuous force through forceps and/or elevation for 2 minutes. The clinician then leaves to do a hygiene exam or perform another brief check for a minimum of 10 minutes. The tooth is delivered easily and with fewer traumas, as the PDL becomes vulnerable by the time extraction is re-engaged. [9]

THE MODIFIED ELEVATOR TECHNIQUE

Congruent to the "wiggle and wait" technique, the instrument (elevator or luxator) is left in place as the clinician vacates the room for a minimum of 10 minutes. The instrument places continuous pressure on the periodontal ligament, generating hyaluronic acid buildup and loosening the ligament, which together provide the prerequisite for an efficient and atraumatic series of extractions. It is suitable to have several sizes of elevators available to achieve this technique. [9]

NOVEL APPROACHES FOR EXTRACTIONS

PARTIAL EXTRACTION TECHNIQUE

Sufficient alveolar ridge height and volume is crucial for attaining the long-term clinical success of dental implants. After extraction, the greatest amount of bone loss occurs on the buccal aspect, as it has thinner bone wall which is composed of large amounts of bundle bone primarily vascularized by the periodontal tooth membrane.[11, 12] Some conventional methods to use to limit buccal bone loss are preservation of the alveolar socket [13], soft-tissue grafts, palatal/lingual wall adjustment of the implant , buccal wall contact preservation,[14] surgery performed without reflection of flap to maintain vascularization, and guided bone regeneration (GBR) with membranes[15-20] and/or with grafting materials.[15-21]

Although these techniques work to a certain extent, they are by no means ideal and none have been shown to completely eliminate the challenge of buccal plate resorption post extraction of teeth.[22] An alternative to the conventional techniques is called ''socket shield'' technique (SST). [23]The concept is to preserve the periodontal ligament (PDL) associated with the buccal portion of the root and the vascular supply. This is done to avoid the buccal bone wall resorption. [23, 24]

Partial Extraction Therapy (PET), which is a variant of socket shield therapy, involves the sectioning and removal of the crown of the tooth. The remaining root portion is then sectioned into two parts, mesio-distally. Following this, the palatal root portion is then carefully extracted without disturbing the buccal portion of the root. The buccal portion of the root is reduced in thickness and in height (up to 1mm above the bone ridge). Following this, an immediate dental implant is placed, palatally to the remaining buccal root portion. [23, 24]

PET is a unique treatment alternative that requires one surgical procedure thus reducing patient morbidity, as well as, reducing overall treatment time and cost associated with treatment.[25] The technique is indicated for the anterior areas of both jaws for teeth that cannot be restored but cannot be applied to teeth with present periodontal disease (present or past), to teeth with mobility or widening of the PDL, to teeth that have vertical root fractures or horizontal fractures below bone level, or to teeth with that exhibit internal/external resorption or endodontic apical pathology, and/or narrow thin roots. [25, 26]

EXTRACTION USING IMPLANT DRILLS

In this method, root walls were thinned from the root canal space with implant drills. Appreciatively less force was needed to deliver the tooth. The risk of traumatizing the thin buccal bone was minimized by primarily drilling towards the palatal bone wall. The implant sites were prepared with standard drills using the bony walls as a guide. After implant site preparation, a periodontal probe was used to estimate the integrity of the bony walls of the alveolus. Total removal of the root remnants was confirmed with the

help of periapical radiographs. [27]
The longest and the widest possible implants (Astra Tech AB, Mo¨lndal, Sweden) were fixed at the buccal-palatal level of bone crest. Successful osseointegration and complete bone healing were observed for all patients. Successful application of this technique can minimize the need of regenerative techniques that may lead to graft or membrane-related complications. [27]

BENEX EXTRACTION SYSTEM
Extraction takes place without causing unnecessary socket expansion by delivering the tooth in the axial direction from its socket. This preserves both bone and soft tissue and reduces the need for flap surgery.[28]
Studies included anterior teeth and premolars unsuitable for forceps extractions, although the system can be used for multirooted teeth after separation. However, an investigation reported a lower success rate in multirooted teeth (43%), whereas single-rooted teeth had a far higher success rate (89%). [29, 30] This system accelerated soft-tissue healing, decreased pain, wound size and a marked reduction in the need to perform flap surgery for the removal of teeth not suitable for forceps extraction. [28, 30]

DISCUSSION
Tissues encircling the tooth are the usual collateral damage involved with traditional extraction methods as well as producing postoperative pain. [31] Often the alveolus is reshaped due to the use of forceps to luxate the tooth or the interproximal bone is damaged by leveraging the tooth against it.Firm tooth, endodontically treated teeth, retained roots and crown fracture cases treated with periotomes resulted in minimal hard and soft tissue damage.[32]
Periotome provided the opportunity to remove such teeth without flap reflection and bone exposure, aiding in preserving the shape of extracted socket. A conductive environment for both immediate and delayed implant placement is provided and prosthetic replacement is enabled due to effective socket integrity. A decreased duration of surgery, frequency and number of analgesics consumed, pain reduction and gingival laceration favored the use of this instrument for extraction.[10]
Partial extraction therapy, in a four-year follow-up study, found 96% of socket shield therapy (SST) sites had no complications which is similar to immediately placed implants. [33] 100% success was reported in one study after a one-year follow-up with 40 SST procedures performed on 30 patients, while another study reported 100% success on nine patient's follow-up between 12-48 months. [34]An investigation compared SST to conventional implant placement and followed up till three years. It was found that on parameters such as implant survival, marginal bone level and the pink aesthetic score, SST was superior in all three categories. [35]
Extraction using implant drills reduced use of graft materials or barrier membranes as this technique provided the protection of the buccal plate. [27] The buccal cortical plate was preserved by this technique even in cases of root fractures where the fracture line was deep in the socket. Using this technique, there was no damage to the labial plate in all cases. Furthermore, the technique that has been used required no extra instruments. [36] At least 4-mm thickness of gingival tissue is required in techniques involving rotation and/or the splitting of a palatal flap to achieve soft-tissue primary closure. Furthermore, they are considered time consuming and sensitive. [8] In this technique, neither flaps were reflected nor were incisions made. Osseointegration was achieved for all implants with stability of the soft tissues. [27]
Benex extraction system showed an overall success rate of 85.4% (276 of 323 teeth) in 240 patients. An incidence of 5.6% for flap surgery was reported, with 18 teeth requiring flap surgery and the vertical tooth extraction cohort showing 47 failures. During the routine care period, of the 94 teeth in 78 patients, 21 teeth could not be extracted using conventional techniques and required flap surgery. [30] It does have a steep learning curve and proper case selection, knowledge in using the device and implementation of that knowledge in treatment planning are important factors in ensuring the success of this system. [28]

CONCLUSION
Implant stability depends on variety of factors such as, surgical techniques involved, bone density as well as implant design. Preservation of continuity of bone is essential to the long term success of implants. Limitations set by conventional techniques have led tothe evolution of newer techniques in response and will provide better clinical success and patient outcomes associated with implants.

REFERENCES
1. Rocchietta I, Fontana F, Simion M. Clinical outcomes of vertical bone augmentation to enable dental implant placement: a systematic review. J Clin Periodontol. 2008 Sep;35(8 Suppl):203-15. doi: 10.1111/j.1600-051X.2008.01271.x. PMID: 18724851.
2. Esposito M, Grusovin MG, Kwan S, Worthington HV, Coulthard P. Interventions for replacing missing teeth: bone augmentation techniques for dental implant treatment. Cochrane Database Syst Rev. 2008 Jul 16;(3):CD003607.
3. Van der Weijden F, Dell'Acqua F, Slot DE. Alveolar bone dimensional changes of post-extraction sockets in humans: a systematic review. J Clin Periodontol. 2009 Dec;36(12):1048-58. doi: 10.1111/j.1600-051X.2009.01482.x. PMID: 19929956.
4. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single-tooth extraction: a clinical and radiographic 12-month prospective study. Int J Periodontics Restorative Dent. 2003 Aug;23(4):313-23. PMID: 12956475.
5. Carlsson GE, Thilander H, Hedegård B. Histologic changes in the upper alveolar process after extractions

with or without insertion of an immediate full denture. Acta Odontol Scand. 1967 Jun;25(1):21-43. doi: 10.3109/00016356709072521. PMID: 5233857.

6. Tallgren A. The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed-longitudinal study covering 25 years. 1972. J Prosthet Dent. 2003 May;89(5):427-35. doi: 10.1016/s0022-3913(03)00158-6. PMID: 12806317.
7. Schiroli G. Immediate tooth extraction, placement of a Tapered Screw-Vent implant, and provisionalization in the esthetic zone: a case report. Implant Dent. 2003;12(2):123-31. doi: 10.1097/01.id.0000055822.98106.94. PMID: 12861879.
8. Covani U, Barone A, Cornelini R, Crespi R. Soft tissue healing around implants placed immediately after tooth extraction without incision: a clinical report. Int J Oral Maxillofac Implants. 2004 Jul-Aug;19(4):549-53. PMID: 15346752.
9. Bessonet, C., et al., Innovations in Extractions with Immediate Implant Placement: Recent Advances in Technique and Implant Engineering. Dentistry Today. 2019.https://www.dentistrytoday.com/innovations-in-extractions-with-immediate-implant-placement-recent-advances-in-technique-and-implant-engineering/
10. Sharma SD, Vidya B, Alexander M, Deshmukh S. Periotome as an Aid to Atraumatic Extraction: A Comparative Double Blind Randomized Controlled Trial. J Maxillofac Oral Surg. 2015 Sep;14(3):611-5. doi: 10.1007/s12663-014-0723-8. Epub 2014 Nov 8. PMID: 26225052; PMCID: PMC4511886.
11. Araújo MG, Sukekava F, Wennström JL, Lindhe J. Tissue modeling following implant placement in fresh extraction sockets. Clin Oral Implants Res. 2006 Dec;17(6):615-24. doi: 10.1111/j.1600-0501.2006.01317.x. PMID: 17092218.
12. Araújo MG, Sukekava F, Wennström JL, Lindhe J. Ridge alterations following implant placement in fresh extraction sockets: an experimental study in the dog. J Clin Periodontol. 2005 Jun;32(6):645-52. doi: 10.1111/j.1600-051X.2005.00726.x. PMID: 15882225.
13. Lee AMH, Poon CY. The Clinical Effectiveness of Alveolar Ridge Preservation in the Maxillary Anterior Esthetic Zone-A Retrospective Study. J Esthet Restor Dent. 2017 Apr;29(2):137-145. doi: 10.1111/jerd.12280. Epub 2017 Feb 10. PMID: 28185397.
14. Karaca Ç, Er N, Gülşahı A, Köseoğlu OT. Alveolar ridge preservation with a free gingival graft in the anterior maxilla: volumetric evaluation in a randomized clinical trial. Int J Oral Maxillofac Surg. 2015 Jun;44(6):774-80. doi: 10.1016/j.ijom.2015.01.015. Epub 2015 Feb 11. PMID: 25682463.
15. Sheikh, Z., C. Sima, and M. Glogauer, Bone Replacement Materials and Techniques Used for Achieving Vertical Alveolar Bone Augmentation. Materials, 2015. 8(6): p. 2953-2993.
16. Kunkel M, Wahlmann U, Reichert TE, Wegener J, Wagner W. Reconstruction of mandibular defects following tumor ablation by vertical distraction osteogenesis using intraosseous distraction devices. Clin Oral Implants Res. 2005 Feb;16(1):89-97. doi: 10.1111/j.1600-0501.2004.01073.x. PMID: 15642035.
17. Canullo L, Trisi P, Simion M. Vertical ridge augmentation around implants using e-PTFE titanium-reinforced membrane and deproteinized bovine bone mineral (bio-oss): A case report. Int J Periodontics Restorative Dent. 2006 Aug;26(4):355-61. PMID: 16939017.
18. Barone A, Covani U. Maxillary alveolar ridge reconstruction with nonvascularized autogenous block bone: clinical results. J Oral Maxillofac Surg. 2007 Oct;65(10):2039-46. doi: 10.1016/j.joms.2007.05.017. PMID: 17884536.
19. Sheikh, Z., et al., Collagen based barrier membranes for periodontal guided bone regeneration applications. Odontology, 2017. 105(1): p. 1-12. Sheikh Z, Qureshi J, Alshahrani AM, Nassar H, Ikeda Y, Glogauer M, Ganss B. Collagen based barrier membranes for periodontal guided bone regeneration applications. Odontology. 2017 Jan;105(1):1-12. doi: 10.1007/s10266-016-0267-0. Epub 2016 Sep 9. PMID: 27613193.
20. Sheikh, Z., et al., Natural graft tissues and synthetic biomaterials for periodontal and alveolar bone reconstructive applications: a review. Biomaterials research, 2017. 21(1): p. 9. Sheikh Z, Hamdan N, Ikeda Y, Grynpas M, Ganss B, Glogauer M. Natural graft tissues and synthetic biomaterials for periodontal and alveolar bone reconstructive applications: a review. Biomater Res. 2017 Jun 5;21:9. doi: 10.1186/s40824-017-0095-5. PMID: 28593053; PMCID: PMC5460509.
21. Sheikh, Z., S. Hasanpour, and M. Glogauer, Bone Grafting, in Mandibular Implant Prostheses. 2018, Springer. p. 155-174.
22. Araújo MG, Silva CO, Misawa M, Sukekava F. Alveolar socket healing: what can we learn? Periodontol 2000. 2015 Jun;68(1):122-34. doi: 10.1111/prd.12082. PMID: 25867983.
23. Hürzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S. The socket-shield technique: a proof-of-principle report. J Clin Periodontol. 2010 Sep;37(9):855-62. doi: 10.1111/j.1600-051X.2010.01595.x. PMID: 20712701.
24. Saeidi Pour R, Zuhr O, Hürzeler M, Prandtner O, Rafael CF, Edelhoff D, et al. Clinical Benefits of the Immediate Implant Socket Shield Technique. J Esthet Restor Dent. 2017 Apr;29(2):93-101. doi: 10.1111/jerd.12291. Epub 2017 Feb 12. PMID: 28190282.
25. Gharpure AS, Bhatavadekar NB. Current Evidence on the Socket-Shield Technique: A Systematic Review. J Oral Implantol. 2017 Oct;43(5):395-403. doi: 10.1563/aaid-joi-D-17-00118. Epub 2017 Jun 12. PMID: 28604262.
26. Sheikh, Z., et al., Partial Extraction Therapy: An Approach to Preserve the Buccal Plate. Oral Health Journal. 2019. https://www.oralhealthgroup.com/features/partial-extraction-therapy-an-approach-to-preserve-the-buccal-plate/
27. Yalcin S, Aktas I, Emes Y, Kaya G, Aybar B, Atalay B. A technique for atraumatic extraction of teeth before immediate implant placement using implant drills. Implant Dent. 2009 Dec;18(6):464-72. doi: 10.1097/ID.0b013e3181bcc6d9. PMID: 20009599.
28. Makki AZ, Nassar AA, Alharbi WM, Bisharah WF, Alabdali MA, Alqurashi AM, et al. Evaluation of post-extraction healing after atraumatic axial tooth extraction using Benex system II versus conventional extraction: Randomized control trial. Saudi Dent J.

2021 Dec;33(8):923-928. doi: 10.1016/j.sdentj.2021.09.002. Epub 2021 Sep 14. PMID: 34916765; PMCID: PMC8665233.

29. Muska E, Walter C, Knight A, Taneja P, Bulsara Y, Hahn M, et al. Atraumatic vertical tooth extraction: a proof of principle clinical study of a novel system. Oral Surg Oral Med Oral Pathol Oral Radiol. 2013 Nov;116(5):e303-10. doi: 10.1016/j.oooo.2011.11.037. Epub 2012 Jul 3. PMID: 22762920.
30. Hong B, Bulsara Y, Gorecki P, Dietrich T. Minimally invasive vertical versus conventional tooth extraction: An interrupted time series study. J Am Dent Assoc. 2018 Aug;149(8):688-695. doi: 10.1016/j.adaj.2018.03.022. Epub 2018 May 24. PMID: 29803427.
31. Pozzi A, Gallelli L. Pain management for dentists: the role of ibuprofen. Ann Stomatol (Roma). 2011 Jul; 2(3-4 Suppl):3-24. Epub 2012 Apr 15. PMID: 22888399; PMCID: PMC3414241.
32. Levitt D. Atraumatic extraction and root retrieval using the periotome: a precursor to immediate placement of dental implants. Dent Today. 2001 Nov;20(11):53-7. PMID: 11715649.
33. Gluckman H, Salama M, Du Toit J. A retrospective evaluation of 128 socket-shield cases in the esthetic zone and posterior sites: Partial extraction therapy with up to 4 years follow-up. Clin Implant Dent Relat Res. 2018 Apr;20(2):122-129. doi: 10.1111/cid.12554. Epub 2017 Nov 26. PMID: 29178381.
34. Zhu YB, Qiu LX, Chen L, Gao M, Yu HJ, Wang J. [Clinical evaluation of socket shield technique in maxillary anterior region]. Zhonghua Kou Qiang Yi Xue Za Zhi. 2018 Oct 9;53(10):665-668. Chinese. doi: 10.3760/cma.j.issn.1002-0098.2018.10.004. PMID: 30392222.
35. Bramanti E, Norcia A, Cicciù M, Matacena G, Cervino G, Troiano G, et al. Postextraction Dental Implant in the Aesthetic Zone, Socket Shield Technique Versus Conventional Protocol. J Craniofac Surg. 2018 Jun;29(4):1037-1041. doi: 10.1097/SCS.0000000000004419. PMID: 29489581.
36. Babbush CA. A new atraumatic system for tooth removal and immediate implant restoration. Implant Dent. 2007 Jun;16(2):139-45. doi: 10.1097/ID.0b013e3180581656. PMID: 17563504.