

Immediate Early Delayed placement

1. Blanco J, Carral C, Argibay O, Liñares A. Implant placement in fresh extraction sockets. *Periodontol* 2000. 2019 Feb;79(1):151-167. doi: 10.1111/prd.12253.
2. Chrcanovic BR, Martins MD, Wennerberg A. Immediate placement of implants into infected sites: a systematic review. *Clin Implant Dent Relat Res*. 2015 Jan;17 Suppl 1:e1-e16. doi: 10.1111/cid.12098.
3. BT Gallucci GO, Hamilton A, Zhou W, Buser D, Chen S. Implant placement and loading protocols in partially edentulous patients: A systematic review. *Clin Oral Implants Res*. 2018 Oct;29 Suppl 16:106-134. doi: 10.1111/clr.13276.
4. AK Chrcanovic BR, Albrektsson T, Wennerberg A. Dental implants inserted in fresh extraction sockets versus healed sites: a systematic review and meta-analysis. *J Dent*. 2015 Jan;43(1):16-41. doi: 10.1016/j.jdent.2014.11.007
5. TV Esposito M, Zucchelli G, Cannizzaro G, Checchi L, Barausse C, Trullenque-Eriksson A, Felice P. Immediate, immediate-delayed (6 weeks) and delayed (4 months) post-extractive single implants: 1-year post-loading data from a randomized controlled trial. *Eur J Oral Implantol*. 2017;10(1):11-26.
6. DL Fugazzotto PA. Implant placement at the time of maxillary molar extraction: treatment protocols and report of results. *J Periodontol*. 2008 Feb;79(2):216-23. doi: 10.1902/jop.2008.070338.
7. CM Fugazzotto PA. Implant placement at the time of mandibular molar extraction: description of technique and preliminary results of 341 cases. *J Periodontol*. 2008 Apr;79(4):737-47. doi: 10.1902/jop.2008.070293.
8. VX Cosyn J, De Lat L, Seyssens L, Doornewaard R, Deschepper E, Vervaeke S. The effectiveness of immediate implant placement for single tooth replacement compared to delayed implant placement: A systematic review and meta-analysis. *J Clin Periodontol*. 2019 Jun;46 Suppl 21:224-241. doi: 10.1111/jcpe.13054.
9. TN Richard Akin 1, Andrew G Chapple 2 Clinical Advantages of Immediate Posterior Implants With Custom Healing Abutments: Up to 8-Year Follow-Up of 115 Cases *J Oral Maxillofac Surg* . 2022 Dec;80(12):1952-1965. doi: 10.1016/j.joms.2022.08.014. Epub 2022 Aug 30.
10. ES Samvel Bleyan 1, João Gaspar 2, Salah Huwais 3, Charles Schwimer 3 4, Ziv Mazor 5 6, José João Mendes 2, Rodrigo Neiva 3 Molar Septum Expansion with Osseodensification for Immediate Implant Placement, Retrospective Multicenter Study with Up-to-5-Year Follow-Up, Introducing a New Molar Socket Classification *J Funct Biomater* . 2021 Nov 25;12(4):66.

Topic: Immediate implant placement

Authors: Blanco J, Carral C, Argibay O, Liñares A

Title: Implant placement in fresh extraction sockets.

Source: *Periodontol* 2000. 2019 Feb;79(1):151-167.

DOI: 10.1111/prd.12253.

Type: Review

Reviewer: Trisha Nguyen-Luu

Keywords: dental implants, extraction socket, immediate implants

Purpose: To review the placement of implants in a fresh extraction socket

Discussion:

- Classification system for Timing of Implant placement after Tooth EXT:
 - o Based on desired clinical outcomes of wound-healing process
 - o Type 1 Placement: EXT + implant placement in same surgery
 - o Type 2 Placement: implant placement after soft tissue healing but before clinically sig bone fill within socket

- Early placement 4-8 weeks
 - Type 3 Placement: implant placement after sig clinical and or radiographic bone fill within socket (partial bone healing)
 - Early placement 12-16 weeks
 - Type 4 Placement: Insertion of implant in fully healed site
 - Late placement > 16 weeks
- ADV of Type 1 Placement:
 - Decrease # of surgeries and treatment time
 - Ideal implant orientation
 - Bone preservation in EXT area
 - Optimum esthetics of soft tissue
 - Similar survival rate as delayed approach
- DIS of Type 1 Placement:
 - Immediate implant placement itself does not preserve the buccal bone crest to prevent bony dehiscence and soft tissue recession.
 - More difficult closure of flap due to potential lack of KM
 - More difficult attainment of primary stability due to discrepancy btw implant dimension + EXT socket
 - Esthetic complications from soft and hard tissue changes after immediate placement
- Factors that affect bone resorption after immediate implant placement:
 - Size of the alveolus
 - 11-22% of vertical resorption + 29-63% horizontal resorption after 6 months
 - Wider the buccal bone, greater the fill of buccal void + less vertical resorption of the buccal crest
 - Thickness of buccal bone plate
 - Min of 2 mm to prevent vertical resorption
 - Buccal void dimensions- dimension of the space btw inner alveolar wall + implant surface
 - 2x Less bone crest resorption in the molar vs PM area
 - Larger the void, less bone resorption
 - Buccal Bony Dehiscence
 - SS 58% horizontal resorption in the presence of a dehiscence vs intact buccal bone
 - Gingival Biotype
 - 3x more prone to midfacial recession after immediate implant placement
 - Recession tends to be 3 x larger in thin vs thick gingival biotypes
 - Periapical/ Periodontal pathology
 - NSSD in survival rate of implants placed in EXT socket without periapical pathology vs those with a lesion
 - Adequate cleaning, socket curettage/ debridement + CHX irrigation
 - Flapless procedures
 - Flaps detach the periosteum from bone surface which can cause vascular damage + acute inflammatory response which can trigger the resorption of exposed bone surface
 - Immediate implant placement does not SS reduce buccal bone resorption when a flap is raised
 - Implant diameter
 - Wider implants that have contact with buccal bone wall increases vertical bone by 2x
 - Implant positioning
 - Placing implant towards palatal/ lingual bone wall (due to thickness of lingual plate that can prevent bone loss) + 1 mm below coronal margin of buccal bone crest results in sig less vertical buccal bone loss
 - Bone grafts
 - Studies that say bone grafting the void vs no bone graft has NSSD
 - BUT In thin gingival biotype + narrow ≤ 1 mm buccal bone crest, a graft is recommended to prevent vertical buccal bone loss.

- Mainly limits horizontal ridge resorption.
 - CTG
 - Immediate implants with CTG vs no CTG had less vertical buccal bone loss but NSSD
 - However, clinically relevant b/c peri-implant mucosa was sig thicker + coronally positioned.
 - Soft tissue grafting improved the soft tissue stability (gain in soft tissue thickness + less reduction in soft tissue height) + esthetic outcomes.
 - CTG may increase band of KM.
 - Narrow healing abutment or cover screw after immediate implant + wait for gingival regeneration.
 - 2 stage – lingual crestal incision to move KM buccally.
 - Provision restorations
 - Immediate loading: provisional prosthesis connected to the implant during the first week of healing.
 - Early loading: provisional prosthesis connected to implant in 1-8 weeks.
 - Conventional loading: provisional prosthesis connected to implant after 2 months.
 - Immediate implant loading may stimulate bone formation + influence early stages of osseointegration with similar osseointegration + survival rates to implants with delayed loading.
 - Immediate single implant restoration + loading is associated with sig. higher risk of implant failure.
 - Provisional restoration must not have any occlusal contacts.
 - Delayed Provisionalization of immediate implants increase OR by 20 on marginal peri-implant bone level change > 0.5 mm.
 - Mean papilla shrinkage is 2x higher in delayed restoration vs immediate provisionalization.
 - Buccal recession is 2-3 x higher in delayed restoration group vs immediate Provisionalization at 1 year follow up.
 - Abutments:
 - Longer abutments to reduce bone loss.
 - Multiple abutment disconnection + reconnections:
 - Compromised peri-implant mucosal seal + may lead to increased marginal bone loss.
 - Potential for definitive abutments after immediate implant placement to min. peri-implant crestal bone resorption.
 - Antibiotics:
 - Evidence that there is a higher failure rate for pre-operative abs regimen (1.87%) compared to post-op abs (0.51%) and pre/post-op abs regimen (0.75%)
- **Chen + Buser** Survival Rate:
 - 97.1% 1 year survival rate for immediate implants
 - Type 1 + 2 have similar survival rates.
 - Reason for ext, anterior vs posterior, max vs mand, timing of restoration **did NOT sig** affect survival rate
 - NSSD higher rate of failure in posterior + in maxilla
 - 1.78% **SS higher annual failure rate in pt who only received a single dose of ABS** preop vs pt who received 5- 7 days post-op ABS irrespective of Abs used.
 - Pts who did not take amox are 3.34x more likely to have implant failure vs pts who took amox.
- Biological Complications:
 - **Rodrigo:** Higher tendency for crestal bone loss + peri-implantitis in type 1 placement but NSSD
 - **Botticelli:** immediate implants with delayed load maintained or improved mean radiographic bone level during 5 years.
- Technical Complications:
 - Fracture of implant

- Loss of retention
- **Screw/abutment loosening** – 9.7- 12.7 % implants
- Loss of access to hole restoration
- Fracture of abutment or screws + fracture of covering materials of the prosthesis – 0.35%
- Esthetic Complications:
 - Immediate implant placement is associated with partial resorption of buccal bone wall
 - **Botticelli:** 20-25% of patients treated with immediate implant had recession (esthetic problems) but soft tissue was stable > 3 years
 - **Cosyn:** with intact buccal bone plate, thick biotype, flapless sx + immediate prosthesis, advance retraction occurs in < 10%
 - **Bianchi:** Patients that did not receive a CTG + immediate implant had more mucosal recession > 1 mm at the 3- 9 years follow up vs those that did receive CTG
 - Most soft tissue changes occur in the first 3 months + M/D papilla decrease in size during the first year
 - **Sanz:** Papilla had a poor score after definitive prosthesis but at 3 years ~25% of gaps was filled with soft tissue
 - Papilla may regrow over time after implant restoration
 - Immediate Provisional prosthesis may reduce papillae shrinkage + buccal recession at 3 months but NSSD at 1 year
 - < 10% frequency of advanced recession

Conclusion:

- If CBCT shows no bony dehiscence or fenestration immediate implant can be placed
- Atraumatic tooth extraction, adequate cleaning of socket is essential.
- Place implant towards palatal wall + 1 mm subcrestal towards buccal bone plate
- Thick buccal bone > 1.5 mm with thick biotype and a gap < 1.5 mm may not require a bone graft
- CTG tunneled on the buccal aspect is necessary for thin gingival biotypes + highly esthetic demands.
- Provisional restorative should be placed if primary stability is adequate.
- Head of abutment should be at least 1 mm coronal to the buccal bone crest.
- Platform switch with narrow abutments + prosthesis can support hard + soft tissue.
- 5-7 day post-op abs is recommended.

Topic: immediate implants in infected sites

Authors: Chrcanovic BR, Martins MD, Wennerberg A.

Title: Immediate placement of implants into infected sites: a systematic review.

Source: Clin Implant Dent Relat Res. 2015 Jan;17 Suppl 1:e1-e16.

DOI: 10.1111/cid.12098.

Type: systematic review

Reviewer: Erin Schwoegl

Keywords: dental implants; immediate implant placement; infected extraction sites; infection; tooth socket.

Purpose: To review literature on treatment outcomes of immediate DIs placed into sites with infection

Material and methods:

- An electronic search up to March 2013 completed.
- Included animal and human studies, and excluded reviews and case reports.
- Infections included periapical, endodontic, perio-endodontic, and periodontal
- Following questions raised:
 - Does the presence of periodontal or endodontic infection affect immediate implant placement success?
 - What is suggested to address the infection in the socket prior to immediate placement?

Keywords: dental implants; immediate implant placement; infected extraction sites; infection; tooth socket.

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- Following questions raised:
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 - What is suggested to address the infection in the socket prior to immediate placement?

Results: 21 studies on human subjects and X studies on animals included

Humans

- Pecora: 1/32 failed to integrate. The one that failed was placed into a site with a combined endo-perio lesion
- Tripodakis: 1/18 failed in a site of perio of endo lesion
- Rabel + Köhler: 4/95 failed after 1 year; all in smokers
- Del Fabbro: suggested PRGF w immediate DI placement as a viable therapeutic option
- Crespi: 275 DIs immediately placed and loaded; NSSD btwn those placed in infected vs non-infected sites after 48 months
- Jofre: DIs can be immediately placed in infected sites with high success rates w a protocol of abx tx, debridement, anti-sepsis of tissue, and high primary stability

Recommended treatment protocol

- Considering only human studies, tx protocol included: socket debridement, curettage, systemic abx, and postop CHX rinses varying 1-8 wk postop.
- Many performed GBR
- Some included PRGF coating DI, combo of bone, xenograft and PRP, irrigation of socket w abx solution or with CHX 0.12%, and use of erbium laser

Conclusions:

- Findings should be interpreted w caution due to variability in terms of type of DI, site of implant, type of infection, criteria for pt selection, and loading protocol
- High survival rates and normal MBL changes support hypothesis that DIs may successfully osseointegrate when placed immediately after ext of teeth w endo and perio lesions, as long as appropriate procedures are performed prior to placement
 - Procedures include meticulous cleaning and debridement.
 - CHX 0.12% rinse may be indicated in immediate perioperative period.
 - Benefits of socket irrigation w abx solution and systemic abx remain unclear

Topic: Implant placement and loading

Authors: Gallucci GO, Hamilton A, Zhou W, Buser D, Chen S

Title: Implant placement and loading protocols in partially edentulous patients: A systematic review.

Source: Clin Oral Implants Res. 2018 Oct;29 Suppl 16:106-134

DOI: 10.1111/clr.13276.

Type: systematic review

Reviewer: Brook Thibodeaux

Keywords: dental implants, early loading, early placement, immediate loading, immediate placement

Purpose: To answer the PICO question: “ In partially edentulous patients with immediate or early placement and loading protocols, do the implant-prosthetic survival and success differ when compared to conventional protocols?”

Material and methods:

- Systematic review and meta analysis
- Placement protocols
 - Late implant placement: dental implants are placed after completely bone healing, more than 5mo post tooth extraction
 - Early implant placement: dental implants placed w/ soft tissue healing or partial bone healing, 4-8wks or 12-16wks post tooth ext
 - Immediate implant placement: dental implants placed in fresh socket on day of tooth extraction
- Loading protocols
 - Conventional loading: dental implants are allowed to heal for more than 2 months after implant placement with no connection to the prosthesis
 - Early loading: dental implants are connected to prosthesis between 1wk- 2mos post implant placement
 - Immediate loading: dental implants are connected to prosthesis within 1wk of implant placement
- Electronic search using PubMed/Medline, Embase, and Cochrane Central Register of Controlled Trials
- 69 articles included: 15 RCTs, 7 CCTs, 34 prospective cohort studies, 13 retrospective cohort studies

Results:

- Classification
 - Type 1A: Immediate Placement + Immediate Restoration/Loading
 - 35/1,079 implants failed
 - Survival was 98.4%
 - Success ranged from 87-100%
 - Type 1B: Immediate Placement + Early Loading
 - 43 implants failed
 - Survival was 98.2%
 - Success ranged from 93.75-100%
 - Type 1C: Immediate Placement + Conventional Loading
 - 24/963 implants failed
 - Survival was 96%
 - Success ranged from 91.8-100%
 - Type 2A: Early Placement with Soft Tissue Healing + Immediate Restoration/Loading & Type 3A: Early Placement with Partial Bone Healing + Immediate Restoration/Loading
 - No studies reported
 - Type 2B: Early placement with Soft Tissue Healing + Early Loading & Type 3B: Early placement with Partial Bone Healing + Early Loading
 - 0/45 implants failed
 - 100% success rate
 - Type 2C: Early Placement with Soft Tissue Healing + Conventional Loading & Type 3C: Early Placement with Partial Bone Healing + Conventional Loading
 - 5/106 implants failed
 - Survival was 96.3%
 - Success ranged from 100%
 - Type 4A: Late Placement + Immediate Restoration/Loading
 - 42/1,338 implants failed
 - Survival was 97.9%
 - Success ranged from 72.2-100%

- Type 4B: Late Placement + Early Loading
 - 9/789 implants failed
 - Survival was 98.3%
 - Success ranged from 82.4-100%
- Type 4C: Late Placement + Conventional Loading.
 - 11/ 898 implants failed
 - Survival was 97.7%
 - Success ranged from 88-100%

Conclusion: loading protocol appears to be influential in the treatment outcomes for immediate implant placement, with immediate placement and conventional loading being the only scientifically and clinically validated option. Type 1A/B/C have specific placement and loading criteria to ensure clinical efficacy. Routine use can be considered with early implant placement and conventional loading. Early implant placement with early loading had varying results and needs more research, while no research has been reported for early implant placement with immediate loading. The selection of placement/loading types should be determined based on consideration for following specific procedural criteria.

Topic: immediate vs. delayed implants

Authors: Chrcanovic BR, Albrektsson T, Wennerberg A.

Title: Dental implants inserted in fresh extraction sockets versus healed sites: a systematic review and meta-analysis.

Source: J Dent. 2015 Jan;43(1):16-41

DOI: 10.1016/j.jdent.2014.11.007

Reviewer: Amber Kreko

Type: systematic review

Keywords: dental implants, fresh extraction socket, immediate insertion, healed site, implant failure rate, meta-analysis

Purpose: To compare the survival rate of dental implants, postoperative infection, and marginal bone loss of dental implants inserted in fresh extraction sockets and in healed sites

Material and methods:

- Systematic review up to July 2014
- Main search terms used in combination: dental implant, oral implant, fresh extraction socket, immediate placement, immediate insertion, immediate implant
- Clinical human studies only

Results:

- 73 articles included – comparing 8241 inserted in fresh extraction sockets (330 failure 4.00%) and 19,410 inserted into healed sites (599 failures 3.09%)
- Insertion of implants in fresh extraction sockets increases the risk of implant failure by 58%
- No significant effect of implants inserted in fresh extraction sockets on occurrence of post op infection or on magnitude of marginal bone loss in comparison with implants placed in healed sites
- Difference was not statistically significant when evaluating implants placed in maxillae or in mandible, or when studies using implants to rehabilitate patients with full arch prostheses were pooled. Difference was significant for studies that rehabilitated patients with implant-supported single crowns.

Conclusions: Insertion of implants in fresh extraction sockets affects implant failure rates, but not marginal bone loss or occurrence of post op infection. NSD found for implant failures when evaluating implants placed in maxillae or in mandible, or when studies using implants to rehabilitate patients with full arch prostheses. SSD for studies that rehabilitated patients with implant-supported single crowns. Interpret with caution due to biases and uncontrolled confounding factors, most of them not randomized.

Topic: Implant placement

Authors: Esposito M, Zucchelli G, Cannizzaro G, Checchi L, Barausse C, Trullenque-Eriksson A

Title: Immediate, immediate-delayed (6 weeks) and delayed (4 months) post-extractive single implants: 1-year post-loading data from a randomized controlled trial

Source: Eur J Oral Implantol. 2017;10(1):11-26

DOI: n/a

Reviewer: Tam Vu

Type: Clinical

Keywords: immediate, early, delayed, implant placement, clinical outcomes

Purpose: to evaluate outcomes of immediate, immediate-delayed, and delayed implant placement 1 year post-loading

Material and methods:

- 210 pts randomized into 3 groups:
 - 70 immediate post-extraction implant placements
 - 70 immediate-delayed placements at 6 weeks
 - 70 delayed placement after 4 months
- Implant: NobelActive
- If grafting was needed, xenograft (mp3) and resorbable collagen membrane (pericardium, Evolution) used
- Insertion torque:
 - >25 Ncm were loaded after 4 months.
 - <25 Ncm were loaded after 6 months.
- Outcomes measured: crown and implant failures, complications, peri-implant marginal bone level changes, pink esthetic score (PES)
- Followed up for 1-year post-loading

Results:

- Drop out: 3 from immediate, 5 from early, 6 from delayed.

	Implant failure	Mean peri-implant MBLoss	Aesthetic Score
Immediate	4 (6%)	-0.25 mm	12.52
Immediate-delayed	4 (6.2%)	-0.29 mm	12.49
Delayed	1 (1.6%)	-0.31 mm	11.78

- Complications affected all groups (Immediate: 6, Early: 6, Delayed: 4), NSD among groups.
 - Including hemorrhage, pain, screw loosening, chipping of provisional, dry socket
- The majority of pt's were completely satisfied with function and esthetics.

Conclusion:

- NSSD in failures, complications, and pt satisfaction observed in immediate, immediate-delayed, or delayed implant placement.
- Higher failure rates in immediate and immediate-delayed groups.
- MBL changes similar among groups.
- Esthetics were better in immediate and immediate-delayed groups.

Topic: Immediate Implant

Authors: Fugazzotto, P.

Title: Implant Placement at the Time of Maxillary Molar Extraction: Treatment Protocols and Report of Results

Source: J Periodontol. 2008 Feb;79(2):216-23

DOI: 10.1902/jop.2008.070338

Reviewer: Daeoo Lee

Type: Retrospective

Keywords: Bone regeneration; dental implants; maxilla; molar

Purpose: To evaluate long term results of immediate implant placement at the time of maxillary molar extraction.

Material and methods:

- Immediate implant placement (2003-2006) @private practice; 206 female and 180 male.
- Tx
 1. Sufficient Alveolar Bone Height and Wide Interradicular Septum
 1. Initial osteotomy 2.2-mm guide drill -> 2.2-mm-wide tapered osteotome (BL and MD direction) -> 2.8-mm-wide tapered osteotome (BL and MD direction) -> 3.5-mm-wide osteotome (BL and MD direction) -> 4.2 mm tapered osteotome (no manipulation) -> tapered implant (4.8 mm apical diameter with 6.5 mm platform)
 2. If loss of significant portions of the interradicular bone because the implant widened in its most crestal third, a parallel walled, 4.8-mm diameter implant with a 6.5-mm diameter restorative platform was used.
 3. Particulate graft material was placed except when the horizontal defect dimension between the outer aspect of the implant and the surrounding alveolar bone did not exceed 3 mm on any aspect of the implant.
 4. ePTFE and plain gut suture placed
 2. Sufficient Alveolar Bone Height and Narrow Interradicular Septum
 1. Similar to the #1, except a round bur was used to notch the most crestal aspect of the interradicular bone first and then follow the steps of #1-1
 2. A tapered-end implant with a 4.0-mm diameter apex and a 6.5-mm diameter restorative platform was inserted.
 3. Same as #1-3
 4. Same as #1-4
 3. Insufficient Alveolar Bone Height and Wide Interradicular Septum
 1. 2.2 mm wide trephine was used to prepare an osteotomy within 1.0 mm of the sinus floor. A flat-ended osteotome was used to implode the interradicular bone
 2. #1-1
 3. #1-2 and #1-3
 4. #1-4
 4. Insufficient Alveolar Bone Height and Narrow Interradicular Septum
 1. A 2.2-mm-wide tapered-end osteotome was used to the desired depth to increase alveolar bone height; never exceeded 1 mm less than the distance from the sinus floor to the tip of the residual interradicular bone.
 2. The osteotomy was widened sequentially with 2.8- and 3.5-mm-wide tapered-end osteotomes to the already determined osteotomy depth.
 3. Same as #1-2, #1-3, #1-4



Figure 1 Tapered Osteotome

Results:

- Total of 391 implants; 371 regenerative therapy at the time of implant placement.
- 387 out of 391 implants (with abutments and single cemented crowns), and 4 implants were restored as components in a fixed splint by a variety of restorative dentists.
- 80 out of 83 maintained primary closures
- Restored implants were in function for up to 75 months with a mean time of 40.3 months in function. The cumulative survival rate of the implants in function was 99.5% (criteria of Albrektsson et al.)

Conclusions: Implant placement at the time of maxillary molar removal with concomitant regeneration as needed and subsequent restoration with unsplinted crowns is a predictable treatment modality.

Topic: Immediate implant placement

Authors: Fugazzotto PA

Title: Implant Placement at the Time of Mandibular Molar Extraction: Description of Technique and Preliminary Results of 341 Cases

Source: J Periodontol. 2008 Apr;79(4):737-47.

DOI: 10.1902/jop.2008.070293

Reviewer: Cyrus J Mansouri

Type: Case series

Keywords: Bone regeneration; case series; dental implants; molar.

Background:

The ability to attain osseointegration with IIP has been well established. The ability to predictably place implants into an optimal restorative position in fresh extraction sockets has not been verified.

Purpose:

To present a novel approach to implant placement in an optimal restorative position in fresh extraction sockets of mandibular molars.

Material and methods:

A total of 341 implants were placed in 320 patients at the time of molar extraction.

- Concomitant bone grafting was performed around 332 of the placed implants.

Surgical protocol entailed raising buccal and lingual full thickness flaps and hemisection of the mandibular molar to be removed. Roots were carefully removed sequentially to best preserve remaining interradicular bone.

- In cases where fractured roots required removal of osseous structure, immediate implant placement was not performed, and site was grafted.

Osteotomy preparation entailed a 2.2 mm guide implant drill when crestal interradicular bone was ≥ 3 mm wide mesio-distally.

- If the interradicular bone did not demonstrate a dimension ≥ 3 mm wide mesio-distally, final osteotomy preparation in the desired prosthetic position was accomplished by the implant bur entering the interradicular bone at an angle, with the base of the bur engaging the lateral wall of the most apical extent of the osteotomy preparation. Once the implant bur achieves its set point in the interradicular bone, it is straightened up, and the osteotomy preparation is continued. If initial implant bur placement is into interradicular bone in which no osteotomy attempts have been carried out, the initial entry point of the angled implant bur into the interradicular bone corresponds to the midpoint of the desired final implant position.

Various grafting materials and membranes were used.

- DBBM was placed around 165 implants, demineralized bone putty allograft impregnated with cortical chips was placed around 167 implants, and no grafting material was used around nine implants.
- Collagen membranes were used in 63 sites, titanium-reinforced ePTFE membranes were used in 269 sites. All membranes were secured with fixation tacks.
- No membranes were placed in nine sites.



Figure 1.

A bur enters the interradicular bone at an acute angle. The bur is straightened up during the osteotomy preparation. Subsequent burs enter the osteotomy at a less acute angle until final osteotomy preparation has been achieved.



Figure 2.

An occlusal view of an implant placed in the prepared interradicular bone. The implant is secured by the remaining buccal and lingual aspects of the osteotomized bone of the osteotomy.

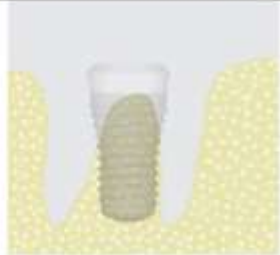


Figure 3.

An implant is placed in the ideal restorative position in the prepared interradicular bone.



Figure 3.
The first molar has been hemisected and extracted without damaging the interdental bone.



Figure 4.
A fractured mandibular first molar exhibits periapical lesions.



Figure 5.
An initial osteotomy has been prepared in the interdental bone using a 2.2-mm-wide bur.



Figure 6.
A radiograph of a guide pin placed in the initial osteotomy is used to assess osteotomy depth and angulation.



Figure 7.
A buccal view of the implant in the prepared interdental bone. Note that the mesial and distal aspects of the interdental septum had been lost during osteotomy preparation. Implant stability is obtained from the residual buccal and lingual aspects of the interdental osteotomy. Regenerative therapy will be performed around this implant.



Figure 8.
A view of the implant restored with a single crown, 72 months in function.

Results:

One implant was mobile 3 weeks post-insertion.

Another was lost after 30 months in function.

A total of 339 implants have been in function for up to 6 years (mean of 30.8 months).

- Survival rate of 99.1%.

Conclusion:

An implant with desirable dimensions may be placed in an ideal restorative position at the time of extraction of a multirooted mandibular molar. When combined with grafting of the horizontal defect dimension remaining in the extraction site, this treatment demonstrates high predictability of implant stability after a mean of 30.8 months in function.

Topic: Immediate vs Delayed Implant

Authors: Cosyn J, De Lat L, Seyssens L, Doornewaard R, Deschepper E, Vervaeke S.

Title: The effectiveness of immediate implant placement for single tooth replacement compared to delayed implant placement: A systematic review and meta-analysis.

Source: J Clin Periodontol. 2019 Jun;46 Suppl 21:224-241.

DOI: 10.1111/jcpe.13054.

Type: Systematic Review

Reviewer: Veronica Xia

Keywords: immediate implant placement, delayed implant placement, implant survival

Purpose:

- Compare single immediate implant placement (IIP) to delayed implant placement (DIP) in terms of implant survival, surgical, clinical, aesthetic, radiographic, and patient-reported outcomes

Materials and Methods:

- Focus question: "In patients in need of a single implant, will IIP as compared to DIP result in different implant survival?"
- PICO:
 - P: adult patient in need of single implant
 - I: IIP (within 24 hours post-extraction)
 - C: DIP (>=3months post-extraction)
 - O: Implant survival (present of implant regardless of clinical condition)
- Secondary objectives assessing need for additional bone augmentation, wound healing complications, MBL, PD, BOP, REC, PES, PRO, technical/biological complications
- Inclusion and exclusion criteria applied to electronic search

Discussion:

- 9 papers □ 8 studies included
- 512 patients, mean age 40-55 □ 517 single implants, follow-up 12-96 months (9% dropout rate)
- Majority of articles included single implants placed in anterior areas
- Implant survival
 - 16 implant failures (3.1%)
 - 12 failures within 6 months after placement
 - 2 failures at 1 year
 - 2 additional failures without time reported
 - 13/16 immediately placed into fresh extraction socket, 3/16 in healed site
 - Failure rate: IIP (5.1%) and DIP (1.1%)
 - 4% difference in implant survival between IIP and DIP (favoring DIP)
 - NSSD difference in implant survival between IIP/DIP among studies including post-op antibiotics
 - Lower implant survival of IIP when no AB administered
 - No difference in implant survival between IIP/DIP based on study design, implant position, or follow-up
- Half of studies had no bone augmentation procedures performed at time of implant placement
 - Need for additional bone augmentation procedures significantly higher in IIP (72%) then in DIP (43.9%)
- Four studies reported on wound healing following IIP/DIP □ optimal healing for all cases in both treatment
 - Tonetti (2017): 5x more wound healing complications following IIP (26.1%) vs DIP (5.3%)
- Majority of studies reported MBL □ NSSD between IIP/DIP when bone augmentation was performed
 - SSD more MBL following IIP when no bone augmentation performed
- 3 studies reported PD (NSSD between DIP/IIP)
 - Raes (2018): deeper PD following DIP
 - Siciliano (2009)/Tonetti (2017): deeper PD following IIP

- 4 studies reported BOP: percentages ranged from 15-30%
- SSD more papillary recession following IIP
- NSSD in PES between IIP/DIP
- IIP/DIP bone tolerated by patients: low pain scores/high patient appreciation scores
- Two studies reported technical complications in over 20% of cases □ veneer chipping/screw loosening
- One study noted that 2 patients experience progressive BL (>2mm) and deep pockets (>6mm) □ peri-implantitis

Conclusion:

- After follow-up ranging from 12-96 months, IIP resulted in significantly lower implant survival than DIP (94.9% vs 98.9%)
 - All failures were early failures □ lack of osseointegration
 - Similar PD/PES for both groups
 - Other clinical parameters inconclusive

Topic: immediate implant placement

Authors: Richard Akin, Andrew G Chapple

Title: Clinical Advantages of Immediate Posterior Implants With Custom Healing Abutments: Up to 8-Year Follow-Up of 115 Cases

Source: J Oral Maxillofac Surg. 2022 Dec;80(12):1952-1965.

DOI: 10.1016/j.joms.2022.08.014

Type: Retrospective case series

Reviewer: Trisha Nguyen-Luu

Keywords: dental implants, custom healing abutments, immediate implants, posterior implants

Background:

Purpose: To determine the survival rate of immediate posterior implants with immediate chairside custom healing abutments

Material and methods:

- 115 patients treated with flapless immediate single posterior implant placement, bone graft with immediate chair-side custom screw-retained healing abutment
- 6.0 mm Zimmer TSV with ≥ 15 Ncm ITV + 50:50 Puros: Bio-Oss
- Anatomic Harmony Abutment Technique:
 - Atraumatic restoration, immediately reconstructing site with custom healing abutment, implant, bone grafting
 - Allows proper emergence to be maintained in the immediate socket so it can predictably be replicated by restorative dentist



FIGURE 1. (A) Diagram of the Anatomic Harmony Abutment (AHA), the custom immediate healing abutment used in this case series. (Fig 1 continued on next page.)

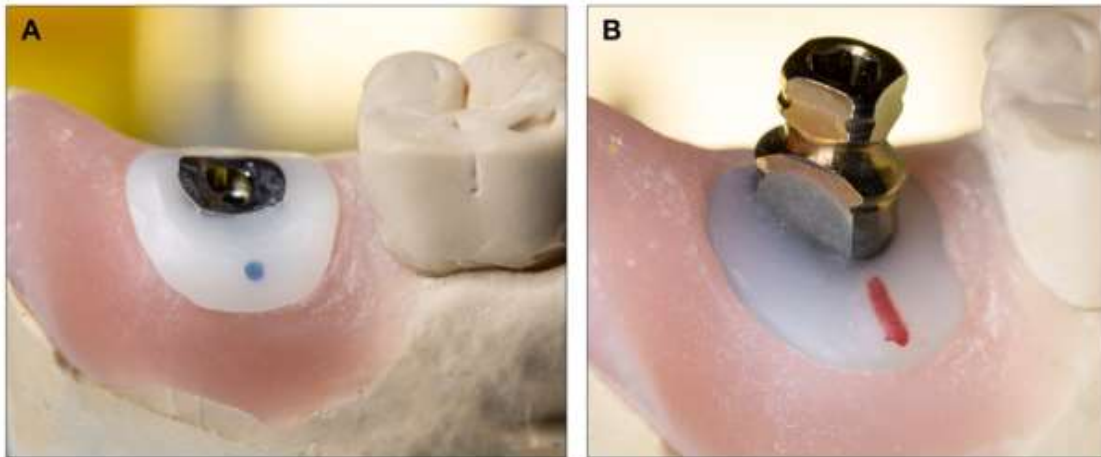


FIGURE 2. Traditional analog laboratory restorative workflow. Labels: (A) Custom healing abutment demonstrated on laboratory model. (B) Customized impression coping on laboratory model.

-
- Primary outcome is implant survival

Results:

- 1 and 5 year survival rate was similar
- At 8 years the overall survival rate was 98.26%- 2 Implant failures
 - o 100% survival rate in the maxilla
 - o 96.08% survival rate in the mandible
 - o Loss of 2 implants within first 6 months

Conclusions

- Anatomic Harmony Abutment Technique allows for socket sealing and transgingival emergence capture
- Customized patient abutments that support + prevent papilla collapse + protect the integrity of the buccal + lingual wall
- **Immediate posterior dental implants + custom healing abutment** are more suitable to wider diameter implant placement, better implant + restorative platform matching + reduce crestal occlusal stresses over the lifetime
 - o reduce the buccolingual alveolar dimension changes associated with staged implants
 - o increase in implant diameter is important for maintenance of implant osseointegration
 - o normalize IP restorative contours to min. excessive gingival embrasure form + mitigate food impaction
 - o reduce risk of buccal restorative margin exposure , restorative disharmony + buccal food entrapment
 - o increase OHI with an ideally contoured final restoration + avoiding ridge laps
 - o improve restorative workflow to create an enviro that eliminates stretching or injuring CT formation
- Most crucial aspect of peri-implant longevity + health is the Biomimetic Control zone

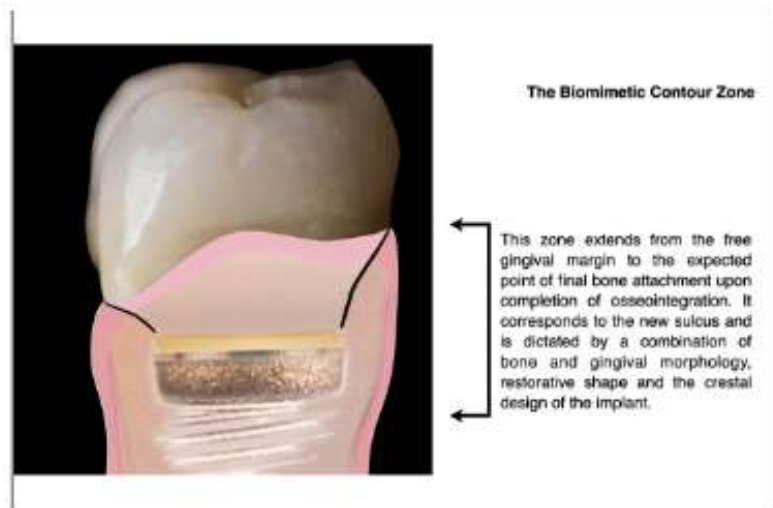


FIGURE 9. Caption: The biomimetic contour zone. Symbol: Parenthetic arrow symbols. Label: This zone extends from the free gingival margin to the expected point of final bone attachment upon completion of osseointegration. It corresponds to the new sulcus and is dictated by a combination of bone and gingival morphology, restorative shape, and the crestal design of the implant.

Akin and Chapple. Immediate posterior implants: 8-year follow-up. J Oral Maxillofac Surg 2022.

Topic: Immediate molar placement

Authors: Bleyan S, Gaspar J, Huwais S, Schwimer C, Mazor Z, Mendes JJ, Neiva R.

Title: Molar Septum Expansion with Osseodensification for Immediate Implant Placement, Retrospective Multicenter Study with Up-to-5-Year Follow-Up, Introducing a New Molar Socket Classification

Source: J Funct Biomater. 2021 Nov 25;12(4):66.

DOI: 10.3390/jfb12040066

Type: retrospective multicenter study

Reviewer: Erin Schwoegl

Keywords: immediate implant placement; osseodensification; osseointegration; osteotomy; septum expansion

Background: Smith + Tarnow classified molar sockets based on amount of interradicular septal bone in relation to DI placement:

- Type A have sufficient septal bone bulk to circumferentially contain DI.
- Type B have enough septal bone bulk to stabilize DI, but not fully surround it.
- Type C have insufficient septal bone to stabilize DI w/o engaging socket walls; necessitates use of ultra-wide diameter DIs or delayed placement
 - However, a 2016 systematic review showed ultra-wide DIs (>6–9 mm) had a significantly higher failure rate vs 4-6mm diameter.
 - Ragucci et al. recommend use of <5 mm diameter DIs for immediate molar DIs

Purpose: To evaluate interradicular septum expansion via osseodensification site preparation for immediate molar DI placement

Material and methods:

- Included pts from 5 different centers

- Inclusion criteria: pts w molar ext sockets w an interradicular septum of 2.5+ mm width, use of osseodensification for site preparation, and a minimum follow-up of 12mo post loading
- Ext technique: flapless ext after separation of roots w a long thin diamond bur followed by thorough curettage of socket
- Septum width measured post ext at the narrowest part of septum.
- DI site preparation: start with pilot drill (clockwise) in center of septum, until 1mm deeper than planned DI length. Densah burs then used in OD mode (CCW, 800–1500 rpm)

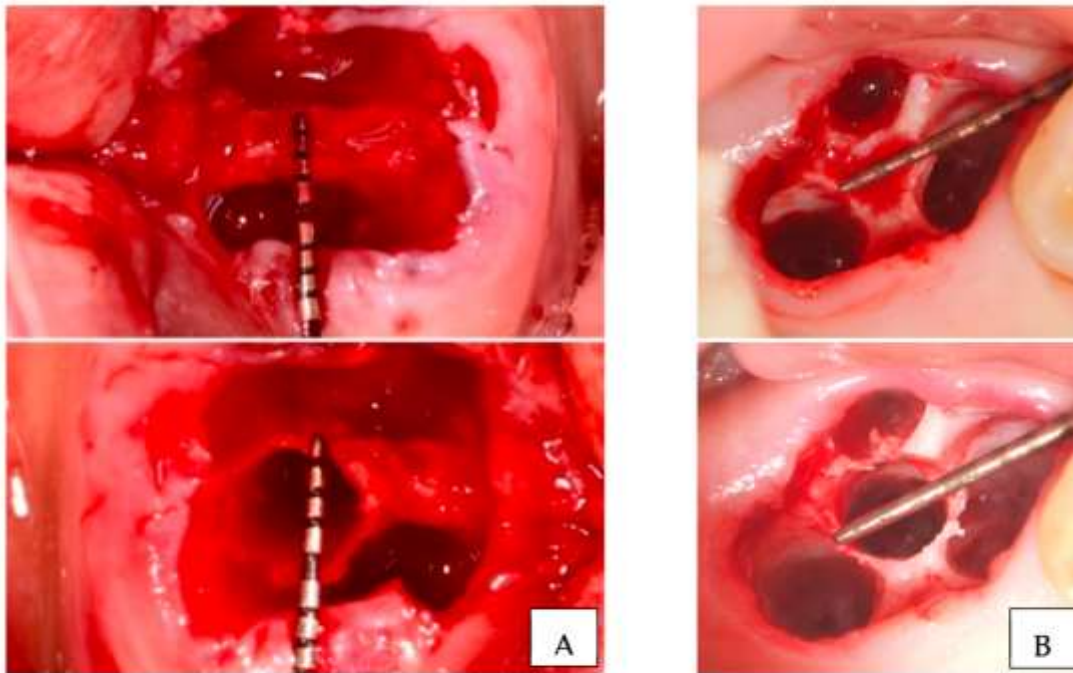


Figure 1. Clinical examples of interradicular septum expansion after implant site preparation with osseodensification ((A). Mandibular first molar; (B). Maxillary second molar).

Results:

- Included 137 pts with 145 immediate molar DIs
- Max sockets had an avg higher interradicular septum width vs mandibular sockets
 - Avg baseline width: 3.3mm
 - Avg width post-osseodensification: 4.65mm
- Avg insertion torque greater for mandibular vs maxillary (46.7 Ncm vs 41.1 Ncm)
- 10 DIs failed; 4 in mand and 6 in maxilla
 - 7 during healing, 3 post-loading
- No correlation could be assessed btwn smoking and DI failure



Figure 8. Representative clinical case with 3-year clinical and radiographic follow-up. (a) CBCT of maxillary left first molar showing periapical infection with extensive bone loss buccally and palatally. (b) Root section for tooth extraction as atraumatic as possible. (c) Septum preservation after extraction. (d,e) Initial osteotomy depth at 10 mm. (f) Implant site preparation, optimized with osseodensification. (g,h) Implant placed in the expanded septum. (i) Allograft placed in the root sockets to fill the extraction socket. (j-l) Adequate implant stability allowed for the placement of a fully contoured customized socket sealing healing abutment out of occlusion. (m) Healing after 3 months, with contour maintenance. (n,o) ISQ measurement after osseointegration period. (p-r) Clinical and radiographic follow-up after 3 years.

New Molar Socket Classification:

- SI: septum width >4mm
- SII: width 3-4mm

- SIII: width 2-3mm
- SIV: width <2mm/no septal bone

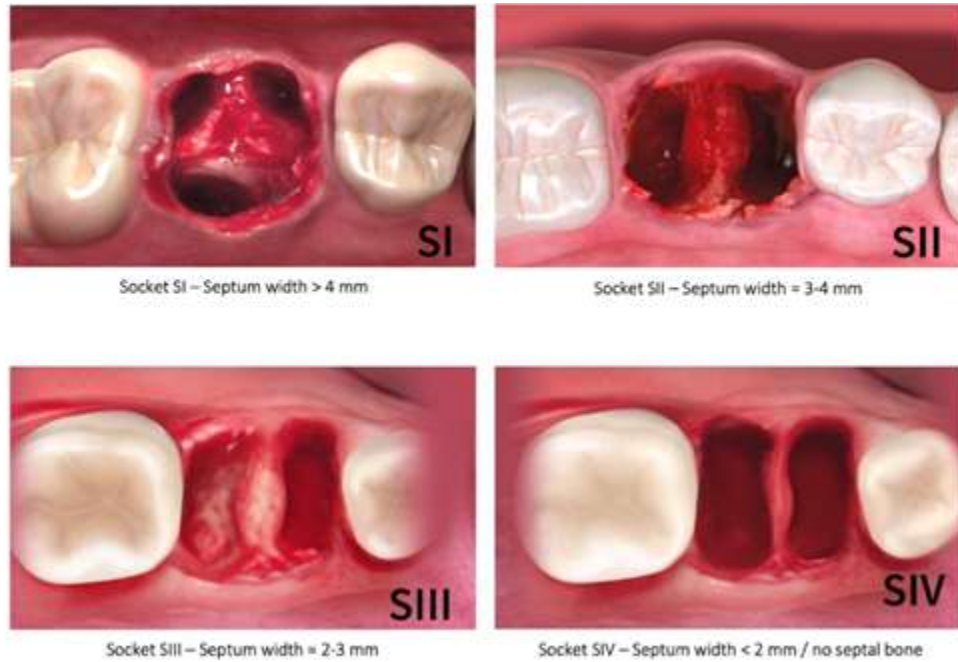
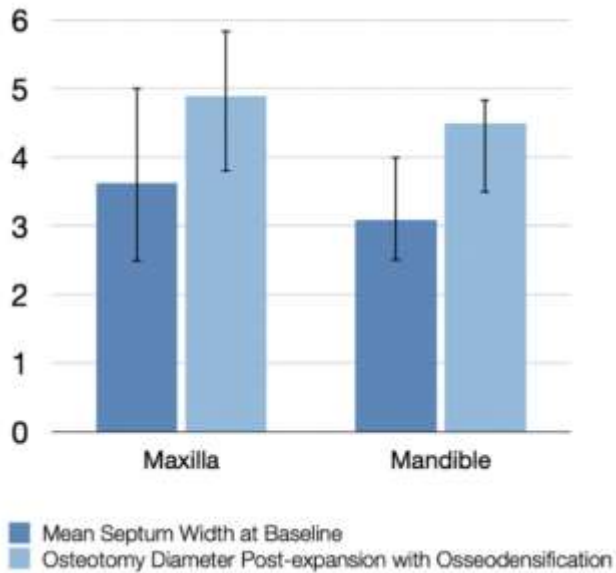


Figure 10. New molar socket classification according to the initial interradicular septum width. (SI—septum width > 4 mm; SII—septum width = 3-4 mm; SIII—septum width = 2-3 mm; SIV—septum width < 2 mm/no septal bone).



Conclusions:

- 5-year retrospective study showed osseodensification is predictable method for septum expansion for immediate DI placement for mand and max molars