



Long-term Outcome and Complications of the Socket Shield Technique in the Esthetic Zone: A Case Report with Narrative Literature Review

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Introduction

Preservation of peri-implant hard and soft tissues is a primary goal in immediate implant placement within the esthetic zone. Following tooth extraction, resorption of the buccal alveolar bone may compromise esthetic outcomes. The socket shield technique (SST) was introduced as a partial extraction approach that retains a buccal root fragment to preserve the periodontal ligament and support the facial bone plate.

Clinical reports and case series have demonstrated favorable short- and medium-term outcomes with SST, including maintenance of buccal bone and soft tissue contours. However, SST is a technique-sensitive procedure, and evidence regarding its long-term behavior and associated complications remains limited. Most available studies report relatively short follow-up periods, leaving uncertainty regarding the predictability of SST over time.

Objective

This presentation shows a case of socket shield technique failure occurring after 10 years of uneventful function and to provide a review of the literature focusing on long-term outcomes and complications associated with SST.

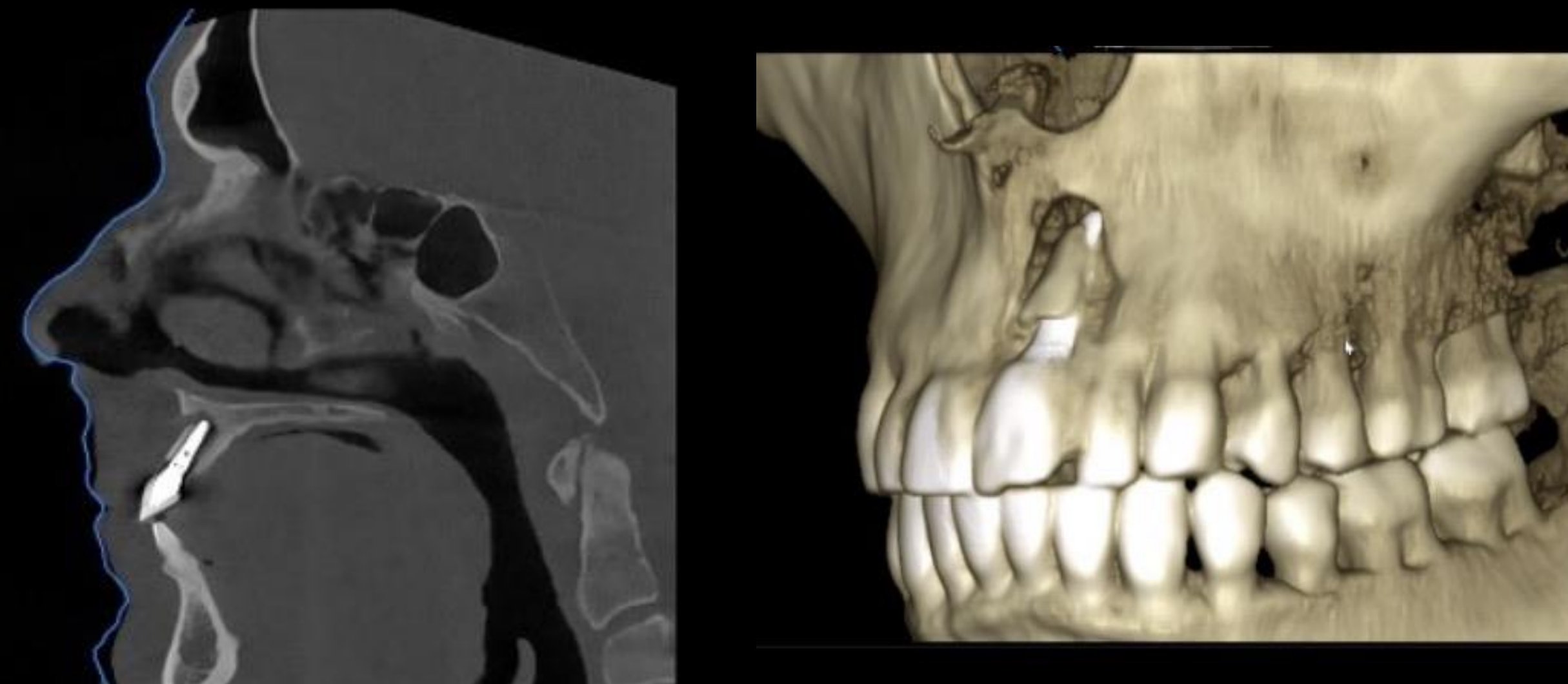


Figure 1: CBCT volumetric reconstruction revealing extensive circumferential peri-implant bone destruction around implant site #9.

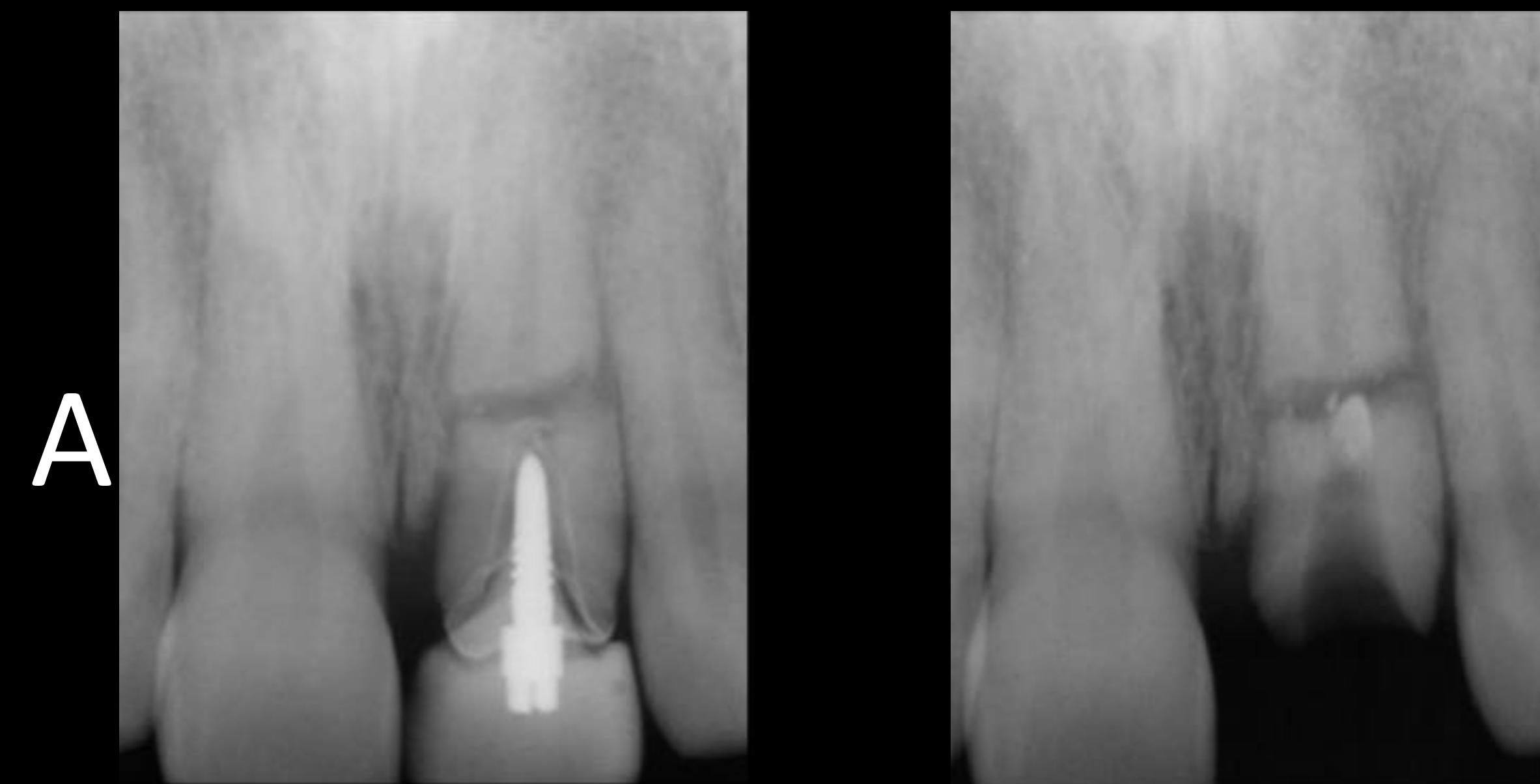


Figure 2: A: 2015 Pre-op x-ray horizontal root fracture #9. B: Post and crown removal 2015

Figure #3: PA #9 during regular dental visit 2020



Case Presentation

A 56-year-old male presented to our clinic in 2024 with the chief complaint, *"My implant is moving."* The implant had been placed in 2016 at site #9 using a socket-shield technique. The patient reported regular dental maintenance visits every six months since implant placement, with no previously reported abnormalities.

Clinical examination revealed mobility of the implant at site #9, along with localized inflammation. Radiographic evaluation demonstrated peri-implant infection associated with a retained socket-shield fragment, loss of osseointegration, severe buccal bone resorption, and palatal bone destruction.

The implant was removed under local anesthesia. A sulcular mucoperiosteal flap was elevated from teeth #8–10. The implant was explanted using forceps, followed by thorough debridement of the defect. Ridge augmentation was performed using an allograft (Straumann Inc. Switzerland) and covered with a double layer of porcine pericardium membrane (Jason membrane, Straumann Inc., Switzerland). Primary closure was achieved.

After a 5-month healing period, re-entry surgery was performed, and a 4.0 × 12 mm Neodent Helix Grand Morse implant (Straumann Inc. Switzerland) was placed in the augmented site with an insertion torque of 25 Ncm. Following an additional 3-month healing period, second stage surgery was done and following that appointment, a scan body was placed for digital impression, and a definitive crown was delivered at site #9 after uneventful osseointegration.



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Literature Review

Focused Question

The focused question for this systematic review, based on the PICO framework, is:

(P)= The patients requiring single-tooth extraction in the esthetic zone who undergo immediate implant placement

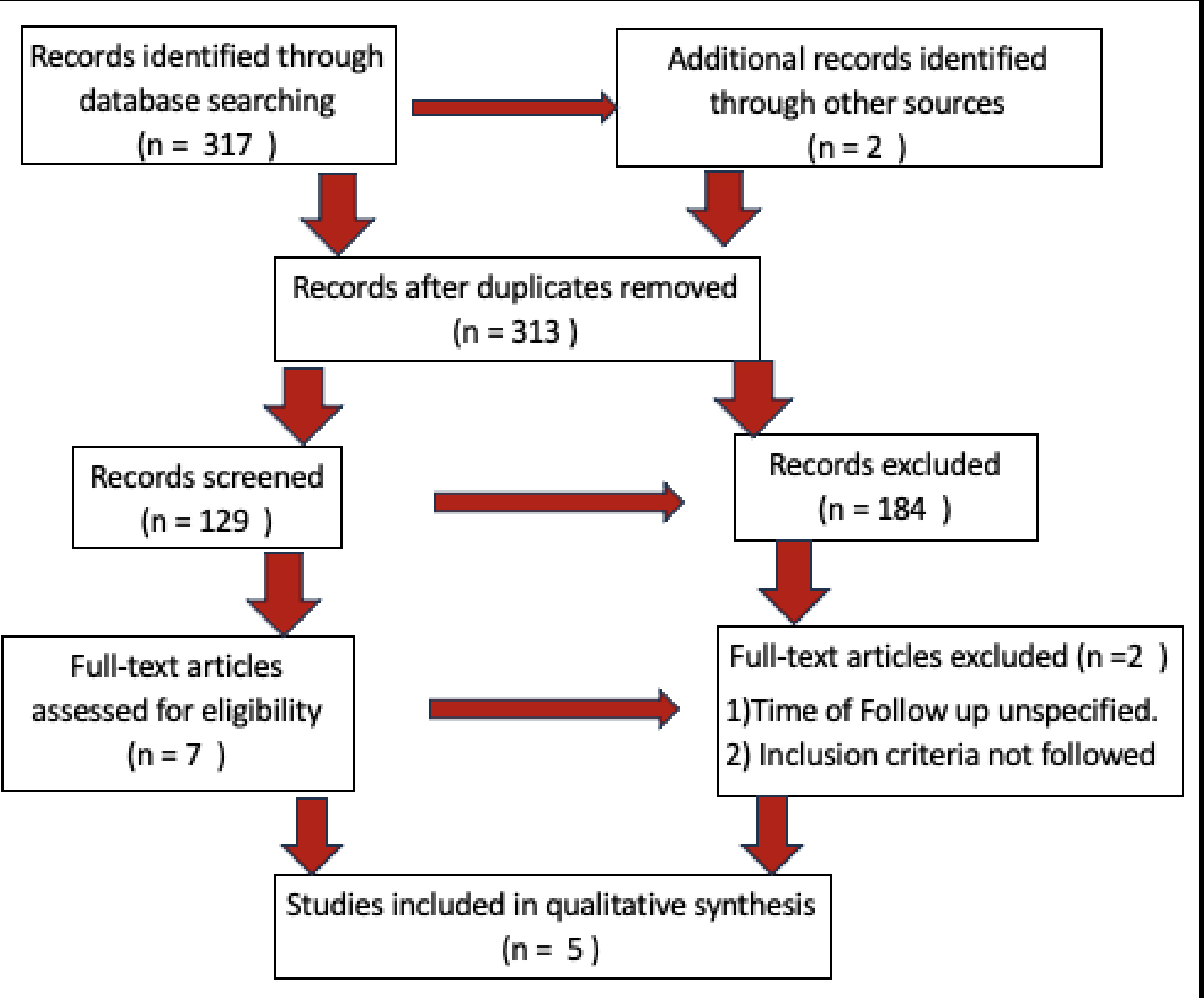
(I)= The Socket Shield Technique

(C)= Conventional immediate implant placement protocols

(O)= Long-term (≥ 3 years) implant survival rates, marginal bone level changes, buccal bone dimensional changes, esthetic outcomes, soft tissue changes, and complication rates

Methods

Figure 4. PRISMA Flow chart developed using PRISMA statement Flow Guide



Electronic Databases (PubMed, DOSS, Cochrane, Embase) were searched from 2010 to present using key words and were filtered for relevant articles by assessing titles, abstracts and full text articles. A total of 129 articles were identified for further review. The articles were categorised and appraised using the Joanna Briggs Institute appraisal tool for randomised control trial and case series.

A total of five articles were appraised for this systematic review.

Inclusion Criteria :Randomized Controlled Trials (RCTs), prospective or retrospective cohort studies, and case series with a minimum of 5 cases evaluating the Socket Shield Technique (SST) and with a follow up of ≥ 3 years were included in this paper. Human patients (adults, typically ≥ 18 years old) requiring single-tooth extraction in the maxillary or mandibular anterior or premolar regions (esthetic zone).The articles were categorised and appraised using the JBI appraisal tool for randomised control trial and case series.

A total of five articles were appraised for this systematic review.

Critical Appraisal

Table 1.Critical Appraisal of RCT using the JBI appraisal tool

Author (Year)	Randomization Appropriate	Allocation Concealed	Baseline Similarity	Blinding Participants	Blinding Providers	Blinding Outcome Assessors	Identical Treatment Other Than Intervention	Complete Follow-up	Intention-to-Treat Analysis	Outcome Measurement Reliable	Appropriate Statistical Analysis	Deviations from RCT design
Bramanti et al 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 2.Critical Appraisal of case series using the JBI appraisal tool

Author (Year)	Clear Inclusion criteria	Consecutive Inclusion of Participant	Patient Demographics Clear	Patient History Clear	Clinical Condition Described	Diagnostic Tests Clear	Intervention Clearly Described	Post-Intervention outcomes described	Adverse Events Reported	Appropriate Statistical analysis
Konstantinos et al 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nguyen et al 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Durrani et al 2020	Y	N	Y	Y	N	Y	Y	N	Y	Y
Trejo et al 2024	Y	N	Y	Y	Y	Y	Y	Y	Y	Y

Results

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, applying the RCT checklist for randomized trials and the case series checklist for observational studies.

One randomized controlled trial (Bramanti et al., 2018) was included. This study demonstrated high methodological quality, fulfilling all assessed JBI criteria. Randomization and allocation concealment were adequately reported, and baseline characteristics were comparable between groups. Blinding of participants, providers, and outcome assessors was reported, and outcome measurements were considered reliable. Follow-up was complete, intention-to-treat analysis was performed, and appropriate statistical analyses were used. No deviations from the randomized controlled trial design were identified, indicating a low risk of bias.

Four case series (Konstantinos et al., 2014; Nguyen et al., 2020; Durrani et al., 2020; Trejo et al., 2024) were included. Overall, these studies demonstrated moderate methodological quality.

All case series clearly defined inclusion criteria, patient demographics, and patient history, and adequately described the intervention and diagnostic methods. Post-intervention outcomes and adverse events were reported, and appropriate statistical analyses were applied.

However, methodological limitations were noted. Consecutive inclusion of participants was not reported in two studies (Durrani et al., 2020; Trejo et al., 2024). Additionally, one study (Durrani et al., 2020) did not clearly describe the clinical condition of participants or post-intervention outcomes, introducing potential selection and reporting bias. These limitations reflect inherent weaknesses associated with case series designs rather than protocol deviations.

Conclusion

The available evidence suggests that the Socket Shield Technique can be associated with favorable clinical and esthetic outcomes when performed in appropriately selected cases. However, the overall certainty of evidence remains limited due to the predominance of non-randomized studies.

Future research should focus on well-designed randomized controlled trials with standardized protocols, comprehensive reporting, and long-term follow-up to strengthen the evidence based and allow more definitive conclusions regarding the clinical effectiveness and long term predictability of the Socket Shield Technique.



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Clinical Implications and Future Directions

References

- SST may yield favorable esthetic outcomes in selected cases; however, current evidence is limited by a predominance of non-randomized studies.
- Late complications can occur, emphasizing the need for long-term follow-up and informed patient consent.
- Current evidence supporting the Socket Shield Technique (SST) is limited, consisting primarily of one high-quality randomized controlled trial and multiple case series of moderate methodological quality.
- Within these constraints, SST may provide favorable clinical and esthetic outcomes when performed in carefully selected cases and executed with precise surgical technique.
- The present case highlights that late-term complications, including peri-implant infection and loss of osseointegration, can occur years after initial success, underscoring the importance of long-term monitoring and patient education.



Figure 5: Failed Implant with socket shield

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