



Evaluating Implant Timing in Orthognathic Surgery for Edentulous Patients: A Systematic Review



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Background

- Edentulism leads to bone resorption, facial asymmetry, and functional deficits.
- Orthognathic surgery restores skeletal alignment and function but lacks dental anchors for stabilization in edentulous cases.
- Dental implants improve stability and serve as prosthetic foundations.
- Optimal implant timing (before, during, or after surgery) remains controversial.
- Objective: To evaluate clinical outcomes and implant survival based on timing of placement in edentulous orthognathic patients

Methods

- Systematic review conducted per PRISMA guidelines using PubMed and Embase
- Inclusion: Studies on edentulous patients undergoing orthognathic surgery with implant placement.
- Exclusion: Dentate patients, oncologic/free flap reconstructions, non-surgical management.
- Data extracted: demographics, surgical type, implant timing, stabilization devices, complications, and outcomes.
- Quality assessment: Joanna Briggs Institute (JBI) critical appraisal tool.
- Statistical analysis: Random-effects meta-analysis, meta-regression

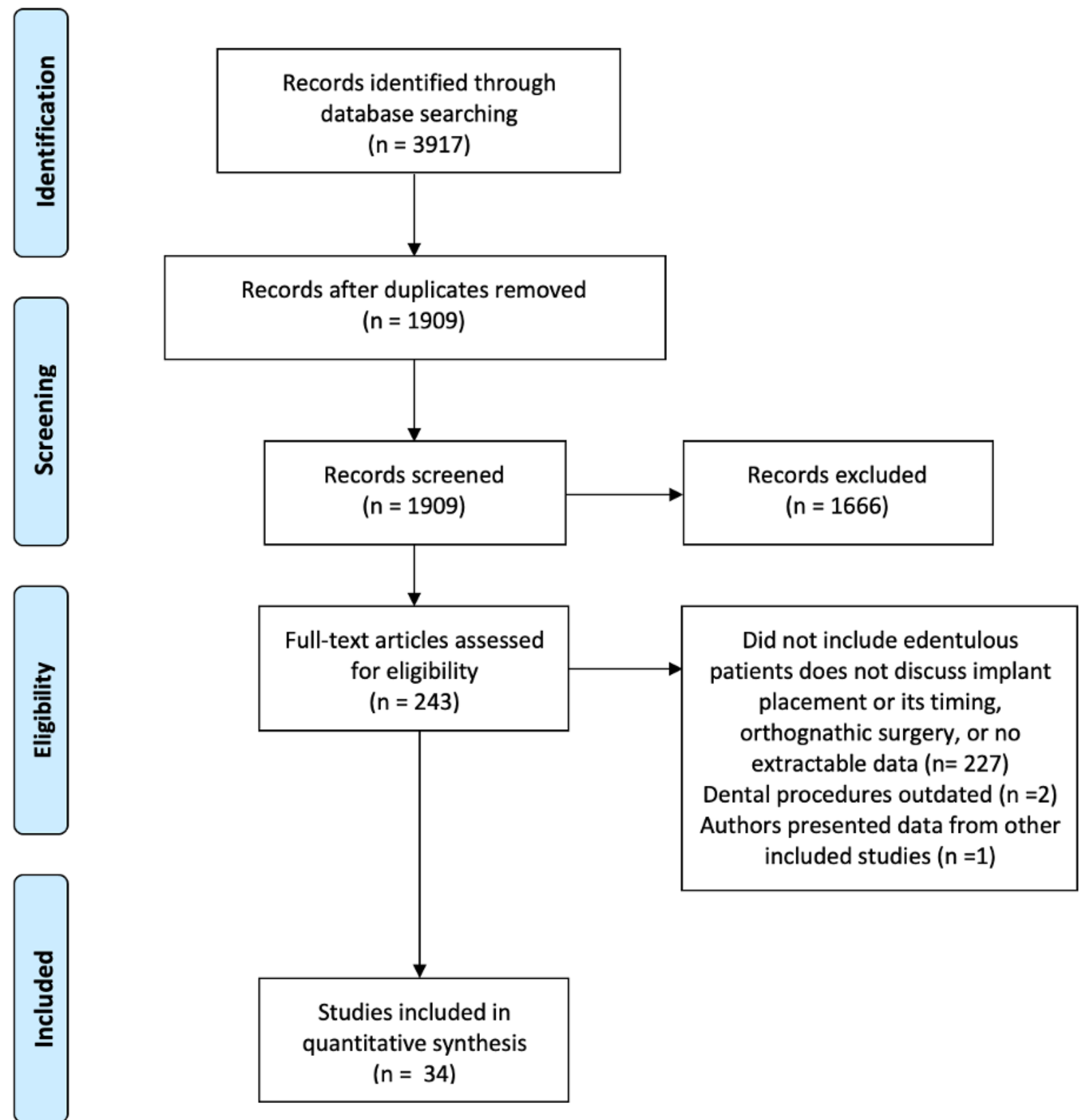


Figure 1. Preferred Reporting Items for Systematic Review and Meta-Analyses flow diagram summarizes the results of the screening process and final article selection

Implant placement timing	No. patients	Percent of total patients (%)	Implants placed	Implants failed	Implant survival rate (%)	Bone graft received	Rate of bone grafting	Bone graft at level of Le Fort	Bone graft at level of implant
Implants after jaw surgery	324	82.4	1559	169	90.8	265	92.3%	96.2%	1.13%
Implants during jaw surgery	63	16.0	506	51	88.4	98	95.1%	100%	0%
Implants before jaw surgery	6	1.53	39	1	93.2	4	66.7%	25%	75%

Table 1. Implant placement demographics and associated clinical outcomes.

Pattern of tooth loss	No. patients	%
Complete maxilla	218	55.0
Complete maxilla and mandible	89	22.5
Partial mandible	1	0.25
Partial maxilla	34	8.59
Partial maxilla and mandible	54	13.6

Figure 2 (Left). Most common tooth loss patterns. Complete edentulism of the maxilla (left), complete edentulism of both jaws (middle), partial edentulism of both jaws (right). Table 2 (Right). Patterns of tooth loss included in study

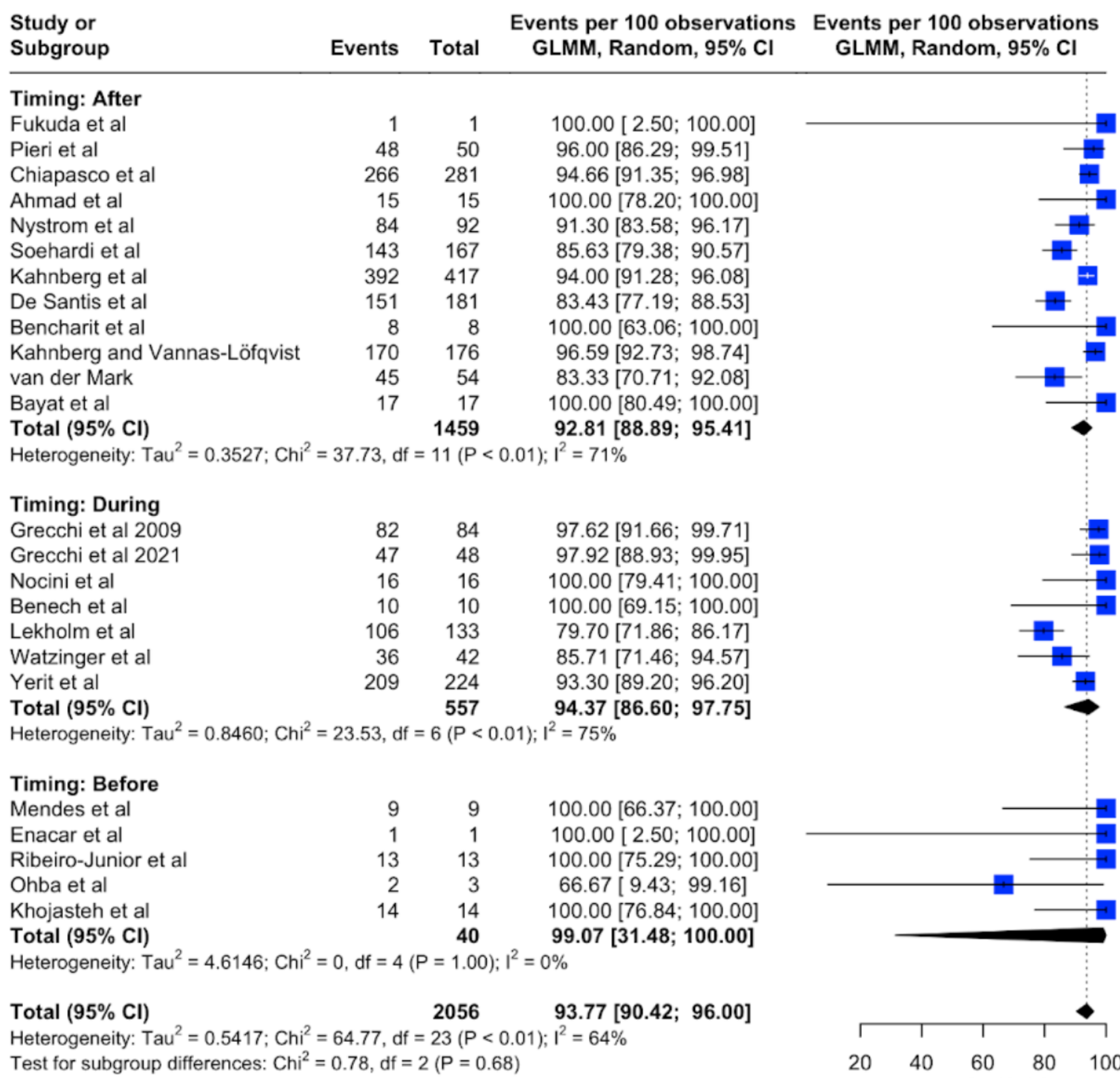


Figure 3. Forest plot of implant survival rates stratified by timing of implant placement relative to orthognathic surgery (after, during, before).

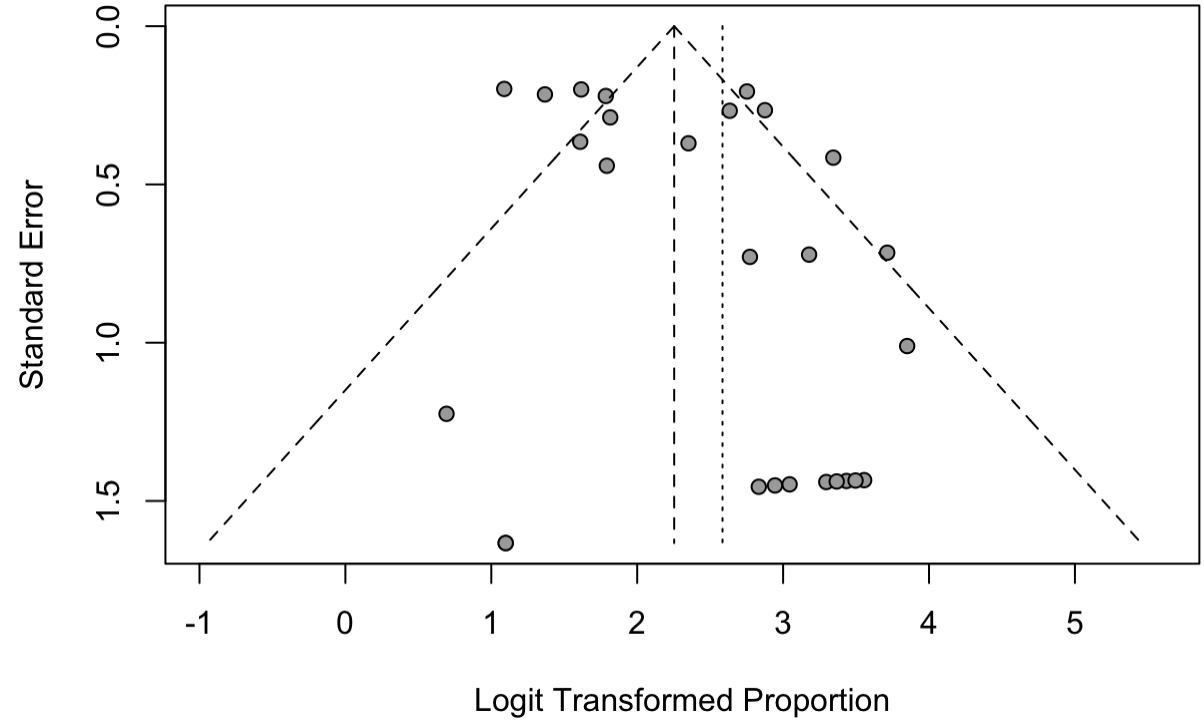


Figure 4 (Left). Funnel plot assessing publication bias among included studies reporting implant survival rates.

Covariate	Estimate	SE	95% CI	P-value
Timing: Implant During Surgery	0.5	0.4	-0.4 to 1.4	0.2
Bimaxillary Osteotomy	0.7	0.6	-0.4 to 1.9	0.2
Missing Tooth Location	0.7	0.5	-0.4 to 1.8	0.2
Age	-0.02	0.03	-0.1 to 0.03	0.3
Male	-0.5	1.2	-2.9 to 1.9	0.7

Table 3 (Right). Meta-regression analysis of potential moderators of implant survival rates.

Results

- 34 studies (396 patients) included; mean age 16–81 years, 67% female. Most common presentation was complete maxillary edentulism (55%), with trauma (47.8%) as the leading cause of tooth loss.
- Implant timing: placed after surgery in 82%, during surgery in 16%, and before surgery in 1.5% (4–6 months preoperatively).
- Pooled implant survival rates: 99.1% (before), 94.4% (during), and 92.8% (after); no significant difference between groups ($p = 0.68$).
- Le Fort I osteotomy was the most common procedure (89.8%), often combined with iliac crest bone grafting (78.1%).

Conclusion

- Implant survival remained consistently high regardless of timing.
- Delayed placement (after surgery) was most common, prioritizing skeletal stability before prosthetic restoration.
- Simultaneous placement shortens treatment time but requires precise intraoperative stabilization.
- Pre-surgical placement offers the highest survival but is reserved for specific anatomic challenges.
- Implant timing can be flexible; patient-specific factors drive outcomes. Future prospective trials are needed to standardize protocols and optimize rehabilitation

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