CASE REPORT

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Cementing stability: innovative polymethyl methacrylate-assisted salvage of mandibular reconstruction hardware

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Abstract (J Korean Assoc Oral Maxillofac Surg 2026;52:196-199)

Hardware exposure after mandibular reconstruction poses significant management challenges. Incomplete removal of reconstruction plates and screws may compromise stability, particularly when osseointegration prevents screw retrieval. A patient who underwent mandibular resection for odontogenic keratocyst with non-vascularized fibular reconstruction developed exposure of the fixation plate. During revision surgery, exposed screws were removed, but several screws remained firmly integrated within the reconstructed bone and could not be retrieved. To prevent destabilization, the plate was retained with the remaining screws, while polymethyl methacrylate (PMMA) bone cement was adapted in the vacant screw sites to restore stability. Postoperative healing was uneventful, and the reconstruction plate remained stable. This report highlights the novel use of PMMA bone cement as a salvage method for plate stabilization in maxillofacial reconstruction, adapting a material widely established in orthopedic surgery for craniomaxillofacial application.

Key words: Mandibular reconstruction, Hardware exposure, Bone cements, Polymethyl methacrylate, Salvage technique

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I. Introduction

Mandibular reconstruction with autogenous bone grafts or fibular grafts requires stable fixation with plates and screws. Late complications, such as hardware exposure, remain clinically significant, with revision often necessitating plate and screw removal. In cases where screws are osseointegrated and cannot be retrieved, plate destabilization becomes a major concern.

Polymethyl methacrylate (PMMA) bone cement, an acrylic resin with well-established use in orthopedic practice, has demonstrated effectiveness in enhancing screw fixation and prosthetic stability. It has been widely applied in procedures such as pedicle screw augmentation, vertebroplasty, and prosthesis fixation due to its biocompatibility and intraoperative adaptability[1-4]. Experimental and clinical studies confirm that PMMA augmentation improves screw anchorage, particularly when fixation rigidity is compromised[5].

To our knowledge, the adaptation of PMMA as a salvage technique for mandibular reconstruction hardware stabilization has not been previously reported. This technical note presents its successful use to maintain plate stability following partial screw removal in a reconstructed mandible, adding novelty by translating orthopedic principles into maxillofacial surgery.

II. Case Report

A patient with a history of mandibular odontogenic keratocyst underwent segmental resection and reconstruction using a non-vascularized fibula graft stabilized with a reconstruction plate.(Fig. 1) Several months later, intraoral hardware exposure was detected.(Fig. 2) Revision surgery was undertaken, during which exposed screws were removed. However, some screws remained firmly integrated within the reconstructed bone and could not be extracted without risking destabilization.

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In order to preserve fixation and avoid additional morbidity, the plate was retained using the remaining screws. To enhance stability, PMMA bone cement (Cemex; Tecres) (Fig. 3), commonly used in orthopedic surgery, was placed in the vacant screw sites. The cement provided additional mechanical support, securing the plate in its original position. Layered closure was performed, and postoperative recovery was uneventful. Follow-up confirmed stable reconstruction without recurrence of exposure or infection.(Fig. 4)

Material used: PMMA bone cement (Cemex; Tecres)

The cement was mixed using a standard powder-liquid ratio, according to the manufacturer's instructions manual in order to achieve a doughy consistency in about 2 to 3 minutes. The working time was approximately 3 to 5 minutes.

Technique: PMMA was packed into the vacant screw holes using a sterile applicator and was adapted around the plate-bone interface for a better mechanical interlocking.

Note was taken to minimise the thermal injury from the exothermic polymerisation reaction, by intermittent saline irrigation during the setting.

III. Discussion

Exposure of fixation hardware is a common late complication in mandibular reconstruction, with reported rates ranging between 10%-20% depending on graft type, defect size, and fixation method. Conventional management includes removal of the exposed plate and screws, which can compromise reconstruction stability if osseointegrated screws cannot be safely retrieved.

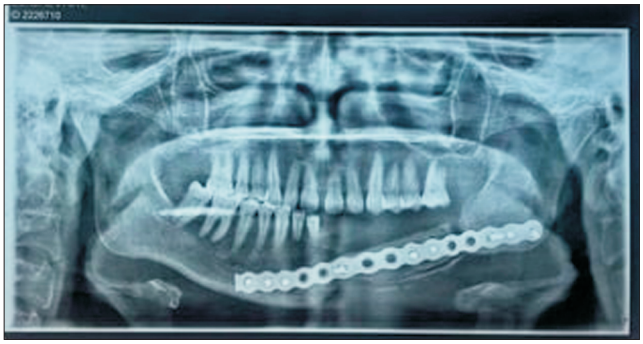


Fig. 1. A non-vascularized fibula graft stabilized with a reconstruction plate.
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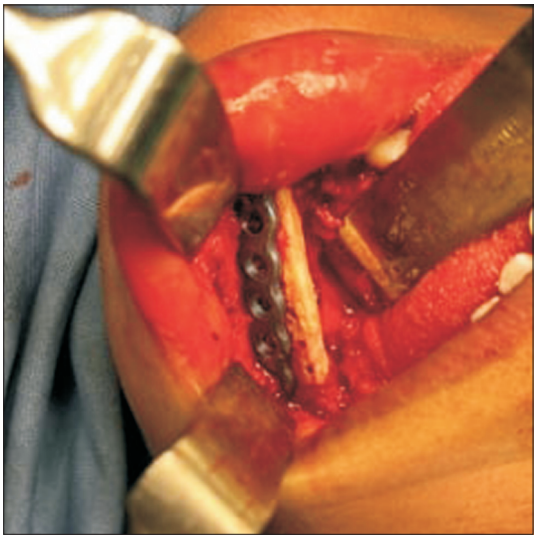


Fig. 2. Intraoral hardware exposure was detected.
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Fig. 3. Polymethyl methacrylate bone cement was placed.
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Fig. 4. Follow-up confirmed stable reconstruction.
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PMMA bone cement has long been recognized in orthopedic surgery for its mechanical reinforcement properties. It provides enhanced fixation strength by augmenting the bone–screw interface and improving anchorage in compromised situations[3,4]. It has also been widely used in craniofacial surgery, particularly in cranioplasty, where it demonstrates reliable mechanical strength and acceptable biocompatibility with predictable clinical outcomes[6,7]. Studies in mandibular models have also demonstrated improved stability when PMMA is applied to fixation screws, reducing micromovement under functional loads[5]. This body of evidence supports the biological safety and mechanical advantage of PMMA in load-bearing situations. Recent literature continues to support the use of PMMA in cranioplasty due to its intraoperative adaptability and durability, although concerns regarding thermal effects and potential toxicity remain[8,9].

1. Biological considerations

Despite it's mechanical strength, PMMA is associated with certain risks such as thermal necrosis, foreign body reaction, or an infection due to its non resorbable nature. As it is only an inert filler material, it may have implications for long term stability. However, it's long standing use in other fields supports it's biocompatibility if used judiciously.

The novelty of the present approach lies in its translation of orthopedic principles to maxillofacial surgery. While PMMA is well established for screw augmentation in orthopedics, its adaptation to salvage plate stability following incomplete screw removal in mandibular reconstruction has not been reported in the literature previously. This technique provides a minimally invasive alternative to complete hardware removal or repeat reconstruction, maintaining stability while preventing further morbidity.

Unlike previous maxillofacial applications which focus on defect reconstruction or cranioplasty, the above technique uniquely addresses hardware salvage without plate removal, thereby reducing surgical morbidity.

2. Limitations

The above report is limited by it's single case report and short-term follow-up. Although encouraging, this method should be considered a salvage option in selected cases. Long-term follow-up and further comparative studies are required to validate its role in routine maxillofacial reconstruction.

3. Conclusion

The use of PMMA bone cement as a salvage adjunct for plate stabilization in mandibular reconstruction represents a novel extension of orthopedic techniques into maxillofacial surgery. This approach provides immediate mechanical reinforcement when complete screw removal is not feasible, thereby preventing destabilization and facilitating successful closure.

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Authors' Contributions

N.A. participated in data collection and writing the manuscript. B.M.R. and L.S. participated in the study design and performed the statistical analysis. B.R.B. participated in the study design and coordination and helped to draft the manuscript. S.T. contributed to critical revision of the manuscript. All authors read and approved the final manuscript.

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Ethics Approval and Consent to Participate

Informed consent was obtained from the patient for the procedure and publication of clinical details. Institutional ethical approval was not required for this technical note as per institutional policy.

Consent for Publishing Photographs

Written informed consent was obtained from the patient for publication of this article and accompanying images.

Conflict of Interest

No potential conflict of interest relevant to this article was

reported.

References

1. Hidalgo DA. Fibula free flap: a new method of mandible reconstruction. Plast Reconstr Surg 1989;84:71-9.
2. Foster RD, Anthony JP, Sharma A, Pogrel MA. Vascularized bone flaps versus nonvascularized bone grafts for mandibular reconstruction: an outcome analysis of primary bony union and endosseous implant success. Head Neck 1999;21:66-71. https://doi.org/10.1002/(sici)1097-0347(199901)21:1<66::aid-hed9>3.0.co;2-z
3. Lewis G. Properties of acrylic bone cement: state of the art review. J Biomed Mater Res 1997;38:155-82. https://doi.org/10.1002/(sici)1097-4636(199722)38:2<155::aid-jbm10>3.0.co;2-c
4. Vaishya R, Chauhan M, Vaish A. Bone cement. J Clin Orthop Trauma 2013;4:157-63. https://doi.org/10.1016/j.jcot.2013.11.005
5. Cankaya AB, Kasapoglu MB, Erdem MA, Kasapoglu C. Effects of polymethylmethacrylate on the stability of screw fixation in mandibular angle fractures: a study on sheep mandibles. Int J Med Sci 2018;15:1466-71. https://doi.org/10.7150/ijms.26697
6. Moreira-Gonzalez A, Jackson IT, Miyawaki T, Barakat K, DiNick V. Clinical outcome in cranioplasty: critical review in long-term follow-up. J Craniofac Surg 2003;14:144-53. https://doi.org/10.1097/00001665-200303000-00003
7. Sunderland IR, Edwards G, Mainprize J, Antonyshyn O. A technique for intraoperative creation of patient-specific titanium mesh implants. Plast Surg (Oakv) 2015;23:95-9. https://doi.org/10.4172/plastic-surgery.1000909
8. Slimani M, Baus A, Bich CS, de Rousiers A, Duhoux A, Brachet M, et al. Methylmetacrylate (PMMA) cranioplasty technique: technical interest of intraoperative modeling and review of the literature. Ann Chir Plast Esthet 2023;68:99-105. https://doi.org/10.1016/j.anplas.2022.09.002
9. Las DE, Verwilghen D, Mommaerts MY. A systematic review of cranioplasty material toxicity in human subjects. J Craniomaxillofac Surg 2021;49:34-46. https://doi.org/10.1016/j.jcms.2020.10.002

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