



International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Mallet and Chisel Versus Rotary Motor or Piezoelectric Instruments in the Removal of Impacted Third Molars: The Ideal Approach in the Primary Care Setting. A Narrative Review

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ABSTRACT :

Background and objective: Removal of impacted mandibular third molars is a routine procedure in which bone removal and tooth sectioning cause most of the surgical trauma. Three osteotomy approaches are in use: mallet and chisel, rotary handpiece and piezoelectric instruments. This review compares their evidence and identifies the most suitable approach for the primary care setting.

Methods: A narrative review of systematic reviews, meta-analyses and clinical comparative studies was undertaken. Literature was identified through targeted searches of PubMed-indexed, Cochrane and open-access sources up to October 2026. Outcomes were operating time, pain, swelling, trismus, nerve disturbance, alveolar osteitis and practical factors relevant to primary care.

Results: Meta-analyses show that piezoelectric surgery lengthens operating time, by about six minutes in one pooled estimate, and reduces swelling and trismus in the early postoperative period. Pain findings are heterogeneous and the underlying trials are of limited quality. Evidence for mallet and chisel comes from small, mostly older trials, and a Cochrane review could not show superiority over a surgical handpiece. Chisel techniques may shorten operating time and avoid aerosols, but the lingual split carries a risk of temporary lingual nerve disturbance and the method depends on operator training. No trial comparing chisel with piezoelectric instruments was identified.

Conclusion: In primary care, a rotary surgical handpiece with irrigation remains the practical default for routine impactions. Piezoelectric instruments are a reasonable adjunct where available and where the benefit justifies longer operating time. Mallet and chisel is best reserved for trained operators and carefully selected cases. Rigorous head-to-head randomised trials are needed.

Keywords: third molar; impacted tooth; piezosurgery; chisel and mallet; rotary instruments; primary dental care

Introduction

Surgical removal of impacted mandibular third molars is one of the most frequently performed operations in oral surgery, and its difficulty depends on the position, depth and angulation of the tooth [1]. The procedure provokes a predictable inflammatory response of pain, swelling and trismus that reduces oral health-related quality of life in the early postoperative days [2]. Postoperative pain rises with surgical difficulty [3], so the steps that cause most tissue trauma, bone removal and tooth sectioning, are the logical place to look for improvement.

Three approaches are in use. The mallet and chisel technique was described in its modified form by Pell and Gregory in 1933 [4], and the lingual split variant was published by Ward in 1956 [5]. Efficient surgical handpieces later displaced the chisel, and contemporary textbooks now illustrate mainly the rotary bur [6]. Piezoelectric surgery, which cuts mineralised tissue with ultrasonic micro-vibrations, is the newest option and has been proposed as a less traumatic alternative to the bur [7,8].

Evidence syntheses have compared rotary with piezoelectric osteotomy [7–11] and the lingual split with the surgical bur [12], and the Cochrane review of surgical techniques concluded that firm recommendations could not be made [13]. What is missing is a comparison of all three approaches against the realities of the primary care setting, where operating time, trained assistance, equipment cost and access to referral differ from hospital practice. The research problem is therefore which instrument offers the best balance of safety, patient morbidity and practicality when a general dental practitioner removes an impacted third molar.

The objective of this review was to compare mallet and chisel, rotary motor and piezoelectric instruments for the removal of impacted mandibular third molars and to propose the ideal approach for the primary care setting.

Materials and Methods

Study design

This is a narrative review. Its reporting was guided by the SANRA scale for narrative reviews [14], and PRISMA 2020 [15] was used as a guide to transparent reporting of the search and selection steps. No protocol was registered.

Search strategy

Targeted searches were run in October 2026 using web-based queries that retrieved PubMed and PubMed Central records, the Cochrane Library and publisher or institutional repositories. Terms combined “third molar”, “wisdom tooth”, “impacted”, “chisel”, “mallet”, “lingual split”, “rotary”, “surgical bur”, “piezoelectric” and “piezosurgery”. Reference lists of key reviews were screened by hand. Searches were limited to English and had no start date.

Eligibility and data extracted

Included were systematic reviews, meta-analyses, randomised and non-randomised clinical comparisons, and technique descriptions in adults undergoing removal of impacted mandibular third molars, provided that at least two of the three instrument approaches were compared or a single approach was described in enough detail to judge its use. Extracted outcomes were operating time, pain, swelling, trismus, nerve disturbance, alveolar osteitis, intraoperative complications and practical factors (cost, training, aerosol generation). Case reports, animal studies and in vitro studies were excluded.

Appraisal and synthesis

Studies were not formally scored for risk of bias. Where included reviews reported risk of bias or heterogeneity, these were carried into the discussion. Findings were synthesised narratively, and the primary care recommendation is the author’s interpretation of the evidence, not a pooled estimate.

Ethics

No patients were recruited and no identifiable data were used, so ethical approval and informed consent were not required.

Results and Discussion

Mallet and chisel versus rotary instruments

The Cochrane review of surgical techniques, updated in 2020 with 27 trials added to the 35 included in 2014, found insufficient evidence to say whether a lingual split with chisel is better than a surgical handpiece for bone removal [13]. An earlier systematic review found only five randomised trials and analysed four, rated their quality as poor with small samples, and reached tentative conclusions of no difference in pain and swelling and some evidence of less trismus after lingual split [12]. An older comparison likewise reported no difference in pain, paraesthesia or infection between lingual split and bur methods [16].

Individual trials point in different directions. In a three-arm trial of 90 patients, the lingual split was more painful and the bur produced more swelling, sensation was unaltered, and a buccal chisel (simplified split bone) technique showed the least morbidity [17]; the Cochrane review rated this trial at high risk of bias for assessor blinding [13]. In a trial of 150 impacted teeth, mean operating time was 37.0 minutes for the lingual split, 39.0 minutes for a buccal chisel approach and 48.3 minutes for the bur [18]. Temporary sensory disturbance lasting one to three weeks was more frequent after lingual split, and alveolar osteitis was commoner in the bur group (8% versus 6% and 4%) [18]. The authors noted that several surgeons operated and that the bur technique was seldom used at their centre, which limits the comparison [18].

Nerve risk deserves emphasis. A systematic review of lingual nerve damage compared buccal approaches with and without lingual retraction and the lingual split, and reported a tendency to more temporary nerve injury when a lingual retractor was used [19]. A bur that passes through the lingual plate can injure the lingual nerve, whereas a chisel that cracks the lingual plate does not breach the periosteum [6].

Mallet and chisel also has clear practical features. Published technique guidance recommends a buccal approach with a monobevel chisel for bone removal and a bibevel chisel to section the crown, abandoning the technique for a handpiece if three blows fail to split the tooth, and avoiding it in an atrophic mandible, osteogenesis imperfecta, large lesions or roots less than half developed [6]. The technique avoids aerosol generation, and two chisels and a mallet cost far less than a handpiece and its repair [6]. Those authors’ experience is uncontrolled, and they note that the method is no longer taught in

modern English-language textbooks and is passed from teacher to trainee [6].

Piezoelectric versus rotary instruments

This comparison has the deepest evidence base. A meta-analysis of randomised trials found less swelling with piezoelectric surgery on postoperative days 1, 3, 5 and 7, but a longer operating time [8]. A later meta-analysis that pooled up to nine studies reported less swelling, better mouth opening, and lower pain and analgesic use with piezoelectric surgery, and a longer procedure (standardised mean difference 0.46, 95% CI 0.33 to 0.58); the pain and analgesic estimates were highly heterogeneous (I^2 of 80% and 82%) [9].

Another meta-analysis found that rotary instruments were faster, and that trismus favoured piezoelectric surgery at days 2, 3 and 5 but not at day 7, while pain and swelling could not be pooled because of heterogeneity [10]. A 2018 meta-analysis reported better mouth opening on day 1 (standardised mean difference 0.84, 95% CI 0.19 to 1.49), an operating time longer by a mean of 6.23 minutes (95% CI 3.32 to 9.14), and no difference in analgesic dose in two trials [11]. The most recent synthesis applied trial sequential analysis to test whether the pooled results were adequately powered [7].

Single trials temper this picture. The split-mouth trial of Mantovani et al. found lower pain with piezosurgery from day 4, lower swelling at day 7 and a shorter operating time with the bur [20]. Two later split-mouth studies found no morbidity advantage for piezosurgery, which also took longer [21,22]. A 2024 split-mouth study of 41 patients reported a median of one day of pain after piezoelectric surgery against two after conventional surgery, and faster resolution of swelling, despite longer operating time [23].

The reliability of these estimates is limited. In one review of ten trials, only one had low risk of bias for allocation concealment, only two for blinding of outcome assessors, and patient blinding was unclear in all [10]; blinding of the surgeon is impossible with either instrument. Reported benefits are largely confined to the first three to five days, while the added operating time is consistent across reviews [8–11]. Because operating time relates to inflammation and pain [3,10], a longer procedure may offset part of the advantage of selective cutting. The cost of the device and a learning curve that may inflate early operating times are further considerations [10].

Mallet and chisel versus piezoelectric instruments

No trial comparing these two approaches directly was identified in the searches performed. Any comparison is indirect, through the rotary handpiece. Chisel techniques offer speed, low cost and no aerosols [6,18], and piezoelectric surgery offers less early swelling and trismus at the price of time and cost [8–11]. Whether either approach reduces rare but serious complications such as nerve injury relative to the bur cannot be settled from trials of this size [13].

Considerations for the primary care setting

Table 1. Comparison of the three osteotomy approaches for primary care.

Factor	Mallet and chisel	Rotary handpiece	Piezoelectric
Operating time	Equal or shorter in trained hands [6,18]	Reference; shorter than piezoelectric [8–11]	Longer; about 6 minutes in one pooled estimate [11]
Early swelling and trismus	Inconsistent; some evidence of less trismus [12]	Reference	Less swelling and trismus in meta-analyses, mainly to day 5 [8–10]
Nerve risk	Temporary lingual nerve disturbance after lingual split [18,19]	Lingual plate perforation can injure the lingual nerve [6]	Selective cutting proposed to spare soft tissue [10]
Aerosols	None [6]	Generated [6]	Generated [6]
Cost	Lowest; chisels and mallet cost far less than a handpiece (US prices, 2021) [6]	Handpiece repair US\$400–700, burs US\$3–5 each (US prices, 2021) [6]	Highest; costly device [10]
Training	Not taught in modern textbooks [6]	Universal	Learning curve [10]
Quality of evidence	Small, older trials [12,13]	Reference standard in textbooks [6]	Several meta-analyses of heterogeneous trials [7–11]

For a general dental practitioner, three questions decide the instrument: how difficult the tooth is, what equipment and training are available, and how

much the patient gains from the extra time or cost.

Rotary handpiece. A surgical handpiece with irrigation remains the practical default. It is available in nearly every surgery, familiar to most clinicians, fast, and supported by the largest body of comparative data, against which both alternatives show only modest, outcome-specific gains [8–11,13]. Operating time should be kept short because it tracks postoperative inflammation [3,10], and care to stay within the buccal and distal bone and avoid perforating the lingual plate addresses the main hazard [6].

Piezoelectric device. Where a practice already owns a unit, it is a sound choice for teeth with deep bone coverage or close to the inferior alveolar canal, and for patients in whom early swelling or restricted opening would be particularly disruptive, provided they are told to expect a longer procedure [8–11]. Its selective cutting is the basis on which it is preferred near the nerve [10], although that protective effect in third molar surgery is not established by the trials reviewed here. Buying a unit solely for third molar surgery is hard to justify on current evidence given its cost and the heterogeneity of the trials [10].

Mallet and chisel. For a trained operator and a carefully selected case, such as a mesioangular impaction (Pell and Gregory class I or II, position A or B) with developed roots in a healthy mandible, it is quick, cheap and aerosol-free, with a defined fallback to the handpiece if the tooth does not split after three blows [6]. The lingual split should be used cautiously because of temporary lingual nerve disturbance [18,19]. Because the technique is no longer widely taught, it should be learned under supervision rather than introduced in isolation [6].

Referral. Deeply impacted teeth, teeth with radiographic proximity to the inferior alveolar canal, and teeth in an atrophic or diseased mandible are beyond routine primary care whatever the instrument, and merit referral or cone-beam imaging.

Limitations

This is a narrative review with a targeted rather than exhaustive search, limited to English, and without formal risk-of-bias scoring. Most trials are small, cannot blind the surgeon, and measure swelling and trismus in different ways [10]. No direct trial compares chisel with piezoelectric surgery. Cost figures come from a 2021 US report and will differ in South Africa [6]. The primary care recommendation is the author's interpretation and should be tested in practice-based research.

Conclusion

For removal of impacted mandibular third molars in the primary setting, the ideal manner is a rotary surgical handpiece with irrigation for routine impactions, chosen for availability, speed and the breadth of its evidence. Piezoelectric instruments are a useful adjunct where already owned and where reducing early swelling or protecting nearby structures justifies a longer operation, about six minutes in one pooled estimate [11]. Mallet and chisel is an inexpensive, aerosol-free option for trained operators and well-selected mesioangular cases, with a ready fallback to the handpiece. None of the three has shown a clear advantage on every outcome. Rigorous head-to-head randomised trials, ideally in primary care, with blinded assessors and standard measurement of swelling and trismus, are needed.

Acknowledgements

None.

Funding Statement

No external funding was received for this review.

Conflict of Interest

The author declares no financial, professional, institutional or personal conflict of interest.

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