Clinical Application of Dental Turbine Combined with Minimally Invasive Extraction Instruments for Low Impacted Wisdom Teeth: A Postprint

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Abstract

Objective To compare the clinical application of turbine-assisted minimally invasive extraction instruments versus conventional extraction methods in the removal of mandibular low-level impacted wisdom teeth, and to analyze their respective advantages and disadvantages. Methods Eighty-two cases of mandibular low-level impacted wisdom teeth requiring extraction were selected and randomly divided into an experimental group and a control group, with 41 cases in each group. The experimental group underwent extraction using minimally invasive instruments combined with high-speed turbine dental drills, while the control group received conventional extraction instruments. The differences between the two groups were compared in terms of root fracture rate, alveolar socket integrity rate, incidence of dental phobia, operation time, and postoperative limitation of mouth opening. Results The experimental group all achieved primary healing, whereas 4 cases in the control group experienced delayed healing due to infection. The root fracture rate was 7.3% in the experimental group versus 22% in the control group. There were 0 cases of incomplete alveolar socket in the experimental group compared to 18 cases in the control group. Dental phobia occurred in 2 cases in the experimental group and 5 cases in the control group. Compared with the control group, the experimental group showed significantly shorter operation time and less severe postoperative limitation of mouth opening, with statistically significant differences ($P<0.05$). Conclusion Compared with conventional extraction methods, the turbine-assisted minimally invasive extraction technique can achieve painless, safe, and minimally invasive outcomes in the removal of mandibular low-level impacted wisdom teeth, demonstrating promising clinical application prospects. Keywords: Minimally invasive tooth extraction

Full Text

Clinical Application of Turbine Combined with Minimally Invasive Extraction Instruments in the Removal of Low Impacted Wisdom Teeth

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Abstract

Objective To compare the clinical efficacy of turbine-assisted minimally invasive extraction versus conventional extraction for mandibular low impacted wisdom teeth. **Methods** Eighty-two patients requiring extraction of mandibular low impacted wisdom teeth were selected and randomly divided into experimental and control groups (n=41 each). The experimental group underwent minimally invasive extraction using a high-speed turbine dental drill combined with a micro-extraction knife, while the control group received conventional extraction instruments. The two groups were compared in terms of root fracture rate, alveolar socket integrity, incidence of dental phobia, operation time, and postoperative trismus. **Results** The experimental group achieved primary healing in all cases, whereas the control group had 4 cases of delayed healing due to infection. The root fracture rate was 7.3% in the experimental group versus 22% in the control group. No cases of incomplete alveolar sockets were observed in the experimental group compared to 18 cases in the control group. Dental phobia occurred in 2 cases in the experimental group and 5 cases in the control group. Operation time was significantly shorter and postoperative trismus was significantly less severe in the experimental group compared to the control group ($P<0.05$). **Conclusion** Compared with conventional extraction methods, the turbine-assisted minimally invasive technique for mandibular low impacted wisdom teeth achieves painless, safe, and minimally invasive outcomes, demonstrating excellent clinical application prospects.

Keywords: minimally invasive tooth extraction; turbine; impacted wisdom tooth

Introduction

Conventional extraction techniques for mandibular impacted teeth frequently require hammering for bone removal or tooth splitting to eliminate resistance [1-3]. This hammering generates substantial vibration, causing significant psychological fear in patients, severe postoperative reactions, and damage to surrounding soft and hard tissues as well as temporomandibular joints. Therefore, providing patients with a painless, safe, and minimally invasive extraction method has become an urgent clinical need. Although the combination of minimally

invasive extraction knives and high-speed turbine dental drills is widely used clinically, reported literature has primarily focused on mandibular mesially impacted wisdom teeth [4-5] and complex mandibular impacted teeth [6]. Few reports address specifically mandibular low impacted wisdom teeth. Due to their deep position, limited surgical field of view, and special anatomical relationships (particularly proximity to the inferior alveolar neurovascular bundle), low impacted wisdom teeth present considerable extraction challenges. This study summarizes and analyzes the clinical outcomes of turbine-assisted minimally invasive extraction instruments in removing low impacted wisdom teeth to provide a reference for clinical practice. We collected 41 cases of mandibular low impacted wisdom teeth extracted using minimally invasive extraction knives combined with high-speed turbine dental drills from January 2016 to January 2017, achieving satisfactory results as reported below.

Methods

1.1 Clinical Data Eighty-two patients with mandibular low impacted wisdom teeth were selected, including 48 males and 34 females aged 16-49 years, all without extraction contraindications. With informed consent, patients were randomly divided into experimental and control groups of 41 cases each. The experimental group received minimally invasive extraction knives combined with high-speed turbine dental drills, while the control group received conventional extraction instruments. All procedures were performed by the same surgeon, with evaluations conducted by another physician according to the study design.

1.2 Surgical Procedure Preoperative X-rays were routinely taken to understand the impaction status and the relationship between tooth roots and the mandibular nerve canal [Figure 1: see original paper]. The surgical area and oral cavity were disinfected with 1% povidone-iodine, and 2% lidocaine was administered for inferior alveolar, lingual, and buccal nerve block anesthesia. Soft tissues were incised to expose surrounding bone.

Experimental group: After removing bone and dental resistance using a high-speed turbine dental drill with specialized long burs, the crown and roots were separated, taking care not to grind too deeply to avoid damaging bone tissue and nerves. The Original Luxator micro-extraction knife (Sweden) was then inserted along the root direction between the root and alveolar bone to sever the periodontal ligament, allowing gentle tooth removal. After extraction, the socket was irrigated with normal saline, sutured, and patients were prescribed oral antibiotics for 3 days. Sutures were removed after 7 days [Figure 2: see original paper].

Control group: Conventional flap and bone removal technique was performed using bone chisels to remove bone. Dental elevators were placed between the tooth and alveolar bone, wedged in using tapping methods, and the tooth was luxated out using leverage. Postoperative management was identical to the experimental group.

1.3 Clinical Evaluation The following parameters were compared between groups: root fracture rate, alveolar socket integrity, incidence of dental phobia, operation time (timed from crown removal with turbine drill after complete anesthesia to completion of socket suture, in minutes), and degree of postoperative trismus.

1.4 Statistical Analysis Data were analyzed using SPSS 15.0 software. Measurement data were compared using t-tests. $P<0.05$ was considered statistically significant.

Results

All extraction sockets healed completely. The experimental group achieved primary healing in all cases, while the control group had 4 cases of delayed healing due to infection. The root fracture rate was 7.3% (3 cases) in the experimental group versus 22% (9 cases) in the control group. Regarding alveolar socket integrity, no cases of incomplete sockets were observed in the experimental group compared to 18 cases (43.9%) in the control group, representing a significant difference. Dental phobia occurred in 2 cases (4.9%) in the experimental group and 5 cases (12.2%) in the control group. The mean operation time was 18±3 minutes in the experimental group versus 28±4 minutes in the control group, with the experimental group showing significantly shorter duration. Postoperative trismus measured 2.8±1.2 mm in the experimental group compared to 8.2±2.2 mm in the control group, demonstrating significantly less severity in the experimental group ($P<0.05$ for all comparisons).

Discussion

Impacted tooth extraction is a surgical procedure involving oral soft and hard tissues and represents a common operation in oral and maxillofacial surgery [7], particularly for mandibular low impacted wisdom teeth. The special anatomical position, proximity to adjacent teeth, and characteristics of surrounding tissues make extraction of mandibular low impacted wisdom teeth particularly challenging [8-10]. Moreover, few studies specifically address the extraction of mandibular low impacted wisdom teeth. Therefore, this study focused on this specific condition to provide clinical guidance.

Conventional extraction mechanics involve lever, wheel-and-axle, and wedge principles, which are often used simultaneously or alternately in wisdom tooth extraction. Traditional extraction instruments, limited by their material and design, primarily employ crown splitting, bone chiseling, and hammering for space creation [11-18], frequently requiring hammer-assisted force that generates substantial vibration. Traditional elevators primarily use leverage, and excessive lever force often leads to complications such as gingival laceration and alveolar bone fracture. Consequently, conventional methods commonly result in numerous postoperative complications including socket pain, facial swelling,

temporomandibular joint dislocation, and alveolar bone fracture, while also inducing patient anxiety, tension, and even dental phobia [19]. In this study, the control group exhibited higher rates of root fracture, dental phobia, and incomplete alveolar sockets, confirming that conventional methods indeed cause more complications and greater physiological and psychological trauma.

Minimally invasive extraction encompasses two aspects: physiological and psychological minimally invasive approaches [20]. This technique avoids using bone chisels and elevators for tooth splitting and leverage, instead employing specialized contra-angle high-speed turbine handpieces with long burs to remove bone and mesial crown resistance, followed by Original Luxator micro-extraction knives to sever the periodontal ligament and compress alveolar bone for gentle root removal [21]. The Original Luxator offers several advantages: its working end morphology (blade shape and curvature closely adapted to the root) and angular design facilitate insertion into the periodontal space; blade sharpness enables easy periodontal ligament transection; and dimensional design allows clinicians to work closely adjacent to the target tooth. The sharp blade and non-slip handle enable smooth insertion into the deep periodontal space with gentle force, eliminating hammering for space creation and alleviating patient fear. Deep insertion into the periodontal space lowers the fulcrum point, reducing risks of alveolar bone fracture, adjacent tooth damage, and root fracture. The technique primarily employs wheel-and-axle and wedge forces rather than leverage, avoiding associated adverse effects [22].

Consequently, minimally invasive instruments minimize damage to both soft and hard tissues during extraction, resulting in fewer postoperative complications and shorter recovery periods. The contra-angle high-speed turbine with long burs can quickly transect resistant crowns without significant patient discomfort, facilitating acceptance of subsequent treatment and substantially reducing dental phobia. Epidemiological surveys report dental phobia rates of approximately 40%-88% [23-25], with extraction ranking as the most feared dental procedure. By eliminating hammering and maximizing alveolar bone preservation, minimally invasive techniques minimize damage to soft and hard tissues, significantly reducing pain and fear while increasing patient trust and acceptance of further dental treatment. In this study, the experimental group achieved primary healing in all cases versus 4 infection-related delayed healing cases in the control group. The experimental group also demonstrated lower rates of root fracture, dental phobia, and incomplete alveolar sockets, significantly shorter operation time, and less severe postoperative trismus. These results confirm that turbine-assisted minimally invasive extraction for low impacted wisdom teeth maximally reduces patient fear and tissue damage, decreases infection risk, and minimizes postoperative pain and swelling. Given these advantages, this technique holds important clinical value for widespread adoption in extracting low impacted wisdom teeth.

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