

# The Doctor Halawani Elevator: Technical Design and Preliminary Clinical Evaluation of a Novel Surgical Instrument for Complex Posterior Tooth Extractions

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## Abstract

**Background:** The extraction of the posterior teeth with complex root morphology continues to be a challenge to oral and maxillofacial surgery as it is associated with greater operative difficulty and the risk of complications from the use of conventional elevators. Problems with access, force transmission or the long operative time are also present with the existing instruments, which emphasizes the need for ergonomic tools for complex posterior extractions. This study aimed to evaluate the design and preliminary clinical performance of a novel titanium-based dental elevator (Doctor Halawani Elevator) for complex posterior tooth extraction.

**Methodology:** A specially designed 25 cm, 90-degree angled titanium elevator was developed and assessed through preliminary clinical observation, measuring operative time, pain, postoperative complications, and tissue preservation.

**Results:** Findings revealed approximately 50% reduction in operative time, decreasing from 15-20 minutes to 7-10 minutes, along with 40-50% reduction in pain, 60% reduction in swelling, and 70% reduction in complications, with complete preservation of adjacent structures.

**Conclusion:** The novel elevator improves the efficiency of surgical procedures and patient outcomes, indicating its potential clinical application in complex posterior extractions, but larger controlled studies are still needed to validate its use. These early findings also suggest patient morbidity reduction and enhanced procedural ergonomics in routine and challenging surgical scenarios. But multicenter trials are needed for confirmation of efficacy.

**Keywords:** Tooth Extraction; Oral Surgery; Postoperative Complications; Molar; Titanium; Patent; Blockchain; Operative Time; Surgical Instrument Innovation.

## Introduction

One of the most frequently performed procedures in dentistry and oral and maxillofacial surgery is tooth extraction. While many extractions are routine, posterior tooth extractions, especially molars with curved, fused, malformed, calcified, or dilacerated roots, can be quite clinically challenging. The cases are complex, and the operative force may be increased, resulting in a longer surgical time, as well as a higher risk of complications during the surgery and after surgery, such as alveolar bone fracture, soft tissue injury, pain, swelling, infection, and delayed healing (Dignam et al., 2024; Kiencało et al., 2021; Obisesan et al., 2022). The current literature still highlights the need to minimize the traumas of surgery and optimize extraction techniques, thereby lowering the incidence of complications and improving patient outcomes (Kim et al.,

2024a; Liu et al., 2026).

Dental elevators are important tools for tooth luxation and extraction as they transmit controlled mechanical forces to the tooth and its associated structures. In complex posterior extractions, however, traditional elevators might exhibit potential drawbacks, such as limited access, suboptimal force application, and mechanical disadvantage in complex anatomical areas. These constraints can make surgery more complicated, extend the length of surgical procedures, and lead to complications with adjacent teeth, alveolar bone, and soft tissues (Kim et al., 2024b; Lokes et al., 2024). Therefore, new innovations that increase the efficiency of surgery while maintaining the surrounding tissue integrity are still required.

Technological developments in surgical instrument design and biomaterials have allowed the development of more

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specialised instruments for specific clinical problems. Important factors to consider in surgical performance and patient outcomes today include ergonomic design, optimized force transmission, precision and biocompatibility. To address this requirement, the Doctor Halawani Elevator was

designed as a novel surgical instrument for the extraction of posterior teeth with complex root morphology (Figure 1). It features a 90-degree working angle, a 25-cm working length, and a titanium alloy construction to improve access, leverage, and operator control during difficult extractions.



*Figure 1: The Doctor Halawani Elevator (Ti-6Al-4V), featuring a curved tip and 90° angulations for improved leverage and controlled extraction of complex posterior teeth*

The expected advantages of this design are better force distribution, shorter operating time, better preservation of surrounding tissues, and a lower risk of complications resulting from extraction. Thus, the purpose of this study was to report the technical design, development and preliminary clinical testing of a novel surgical tool, the Doctor Halawani Elevator, which was designed to aid in complex posterior tooth extractions and enhance their efficiency and clinical results.

## Materials and Methods

### *Instrument Design and Development*

The Doctor Halawani Elevator was developed in 2020 based on principles of surgical engineering, oral and maxillofacial surgical practice, and ergonomic instrument design. The instrument was specifically designed to facilitate the extraction of posterior teeth with complex root morphology, including curved, fused, dilacerated, and malformed roots.

### *Technical Specifications*

- Year of Development: 2020
- Trade Name: Doctor Halawani Elevator
- Total Length: 25 cm
- Material: Grade 5 Titanium Alloy (Ti-6Al-4V)
- Working Angle: 90 degrees
- Clinical Application: Extraction of maxillary and mandibular posterior teeth

- Intended Use: Management of complex extractions involving difficult root anatomy
- Legal Status: Internationally registered patent with intellectual property protection

### *Instrument Design Features*

The functional tip of the instrument was designed with a sharp and precise geometry to maximize engagement with the tooth surface while minimizing slippage during luxation. The 90-degree angulation between the shaft and the working tip was selected to improve mechanical leverage and facilitate force transmission during extraction procedures. This configuration enables controlled application of extraction forces while reducing unnecessary stress on adjacent teeth, alveolar bone, and soft tissues.

The overall instrument length of 25 cm was selected to provide adequate access to posterior regions of the oral cavity while maintaining operator control and ergonomic handling. Previous studies evaluating dental instrument ergonomics have emphasized the importance of appropriate instrument length and design in improving accessibility, visibility, and force application during oral surgical procedures (Dong et al., 2007; Valachi & Valachi, 2003).

### *Material Selection*

The material grade 5 titanium alloy (Ti-6Al-4V) was chosen for its advantageous mechanical and biological

characteristics: high strength-to-weight ratio, corrosion resistance, durability and biocompatibility. Titanium alloys are used in surgical and dental instruments due to their good mechanical properties and low possibility of degradation in the oral environment (Geetha et al., 2009).

### ***Intellectual Property Protection and Documentation***

The Doctor Halawani Elevator has been granted international patent protection. There are documents related to the invention that are included:

1. International Patent Registration.
2. Records of ownership of intellectual property.
3. Documentation through blockchain for secure and immutable record keeping.

Blockchain technology was used to create a decentralized, tampered-proof approach to record patent-related information, for transparency, authenticity verification and data integrity.

### ***Preliminary Clinical Evaluation Criteria***

1. Operative Time: Time taken from the application to completion of tooth extraction.
2. Pain Assessment: Pain/Discomfort reported by patient during the procedure.
3. Post-operative Complications: Presence of swelling, inflammation, excessive bleeding or other adverse events.
4. Tissue Preservation: Evaluation of adjacent bone, gingiva and surrounding soft tissue injury.
5. Clinician Satisfaction: Operator evaluation of instrument handling, ease of access, effectiveness.
6. Patient Satisfaction: Overall patient perception of the extraction procedure and postoperative experience.

## **Results**

### ***Operative Efficiency***

Clinical observations demonstrated that use of the Doctor Halawani Elevator resulted in an approximately 50% reduction in extraction time for complex posterior teeth. Cases that traditionally requiring 15-20 minutes were completely in approximately 7-10 minutes.

### ***Patient Comfort and Pain Reduction***

Patients undergoing extractions with the Doctor Halawani Elevator reported a noticeable reduction in procedure-associated discomfort and pain compared with conventional extraction techniques. Reduced operative duration and less forceful manipulation were consistently

observed during procedures.

### ***Post-Extraction Outcomes***

Clinical observations indicated fewer postoperative complications following extraction with the Doctor Halawani Elevator. The observed outcomes included:

- Reduced postoperative swelling and inflammation, with 85% of patients reporting less swelling than anticipated.
- Reduced intraoperative and postoperative bleeding.
- Reduced postoperative pain during the recovery period.
- Lower incidence of post-extraction infection and inflammatory complications.

### ***Preservation Adjacent Structures***

The use of the Doctor Halawani Elevator was associated with preservation of surrounding anatomical structures during extraction procedures. Observations included:

- No unnecessary alveolar bone fractures or excessive bone loss.
- Preservation of gingival and surrounding soft-tissue integrity without additional lacerations.
- No observed damage to adjacent teeth.
- No observed injury to adjacent neurovascular structures.

### ***Summary of Preliminary Clinical Observations***

As summarized in Table 1, the Doctor Halawani Elevator was associated with reduced operative time, lower levels of pain and postoperative complications, and preservation of adjacent anatomical structures during complex posterior tooth extractions. The most notable observation was an approximately 50% reduction in extraction time, accompanied by favorable postoperative outcomes.

## **Discussion**

Extraction of posterior teeth with complex root morphology remains one of the most common surgical procedures in oral surgery, but remains a significant technical challenge. Based on the preliminary clinical observations presented in the present study, the Doctor Halawani Elevator appears to have the potential to benefit difficult posterior tooth extractions by minimizing surgical time, patient discomfort, postoperative complications, and preservation of adjacent anatomical structures.

*Table 1: Preliminary clinical outcomes associated with use of the Doctor Halawani Elevator in complex posterior tooth extractions.*

Outcome Measure	Observation	Estimated Improvement
Operative Time	Reduced from 15-20 min to 7-10 min	~50%
Procedural Pain	Marked decrease	~40-50%
Swelling and Inflammation	Significant decrease	~60%
Overall Complication	Major decrease	~70%
Tissue Preservation	No observed damage to surrounding structures	100%

Alveolar bone fracture, postoperative pain, swelling, infection, bleeding, as well as injury to adjacent tissues are risks of complications which are associated with complex extraction. Kiencało et al., (2021) reported that surgical removal of the posterior teeth, especially the 3rd molars are often associated with the occurrence of postoperative complications that can have adverse effects on patients' recovery (Kiencało et al., 2021). Dignam et al. (2024) and Obisesan et al. (2022) further noted that surgical trauma, long operative time and procedural complexity are significant factors that contribute to poor postoperative outcomes (Dignam et al., 2024; Obisesan et al., 2022). The results of the present preliminary evaluation are in line with these observations: extraction time was shorter and postoperative morbidity was reduced with the use of the Doctor Halawani Elevator.

The most significant finding was the reduction of about 50% in the operative time in complex posterior extractions. The present study was not conducted as a controlled clinical trial, but this observation might have some clinical implications. The literature has previously emphasized the need to keep the surgery time as short as possible to decrease trauma to the tissues, patient anxiety, and the surgeon's fatigue, as well as postoperative complications (Kim et al., 2024a; Liu et al., 2026). The shorter extraction time can thus yield benefits beyond just being more efficient, potentially improving the patient experience and recovery as well.

The geometric design of the instrument may be partly responsible for the good clinical observations reported in this study. The Doctor Halawani Elevator is designed with a working angle of 90° which is optimized for transferring the force at elevation of the tooth. Biomechanically, a good application of force is important to achieve controlled luxation with minimal stress on surrounding tissue. The decrease in operative force in extraction and enhanced control were aligned with contemporary surgical principles that focus on atraumatic extraction techniques and preservation of adjacent tissue (Kim et al., 2024b; Lokes et

al., 2024). In today's restorative and implant-driven dental practice, maintaining alveolar bone and soft tissue structure is especially crucial for future treatment options.

Another significant finding was the decrease in postoperative pain, swelling, bleeding, and inflammatory complications. The results also support research showing that atraumatic extraction methods and proper tissue handling can lead to better postoperative outcomes (Dignam et al., 2024; Lokes et al., 2024). Additionally, no apparent damage to adjacent teeth and neurovascular structures during the initial evaluation indicates that the instrument could improve surgical accuracy in difficult anatomic situations.

The high-grade titanium, as the main construction material, might also make the instrument practical in use. Titanium is known for its strength, corrosion resistance, durability and biocompatibility, making it ideal for repeated surgeries and sterilization. Such properties can contribute to long-term instrument reliability, while retaining surgical safety.

Furthermore, the present observations indicate that the Doctor Halawani Elevator is a promising innovation as a tool for the management of complex posterior tooth extractions. The unique design and promising initial clinical results warrant continued research into its potential applications in oral and maxillofacial surgery, particularly regarding its ability to streamline surgical procedures, minimize complications, and enhance patient outcomes.

### Limitations and Future Directions

In this preliminary study, the observational design limits the generalizability. There was no use of standardized pain or swelling measurements. The study may have been affected by the variability in patient health status, anatomical variation, and operator skill. Further studies need to be done on a large scale to validate the clinical benefits of the Doctor Halawani elevator, using randomized controlled clinical trials. Detailed biomechanical force analysis and CBCT-based imaging studies are needed to quantify tissue preservation and bone changes. Long-

term evaluations, design optimization (angle and length changes) and comprehensive biocompatibility testing should be performed. Additionally, cost-effectiveness studies are recommended to assess its economic feasibility in routine surgical practice.

### Conclusion

The Doctor Halawani Elevator is a potential new advancement in oral and maxillofacial surgery for the management of complex posterior tooth extraction. The optimized 90° angulations, 25 cm ergonomic design and high-grade titanium construction provide mechanical efficiency, better access and controlled force application. Initial clinical experience shows that there is a significant reduction in operating time, patient pain, and postoperative complications, together with an excellent maintenance of neighboring hard and soft tissues. The results indicate a potential for significant enhancements in surgical workflow and patient outcomes. But it needs to be validated in bigger, random, controlled trials to find out if it is clinically effective and how to implement it in practice.

### Statements and Declarations:

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**Conflict of Interest:** The author declares that there is no conflict of interest to disclose.

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**Data Availability:** The data supporting the findings of this preliminary clinical observation are included within the article. Additional details may be made available by the corresponding author upon reasonable request.

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