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The Periotome as a Tool for Atraumatic Tooth Extraction – A Review of the Literature

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Abstract

Background: The rapid advancement of implantology necessitates the use of extraction methods that preserve bone tissue.

Aim: The objective of this study is to review the literature on periotomes as tools for atraumatic tooth extraction, evaluate their clinical benefits, and assess periotome models currently available on the market.

Materials and methods: A review of the available scientific literature from the years 2004-2025 was conducted to evaluate the clinical application of periotomes, and their impact on alveolar bone preservation and implant treatment outcomes.

Results: Periotomes allow practitioners to precisely sever the periodontal ligament, minimizing trauma to the bone and soft tissues. Unlike traditional methods, they do not require forceful luxation. Studies show that their use is associated with less bone loss than with piezotomes and faster wound healing. These instruments come in many variants (straight, curved, titanium), allowing them to be adapted to the tooth's morphology.

Conclusions: The use of periotomes is an efficient and cost-effective method for preserving the alveolar ridge. These instruments reduce post-operative pain and are essential for preparing the implant site, offering a safe alternative to more invasive techniques.

Key words: oral surgery, periodontology, periotomes, tooth extraction, tooth ligament

1. Introduction

Contemporary dentistry is facing a fundamental shift in its philosophical approach to surgical procedures. Where traditional practice once prioritized the rapid removal of a problematic tooth as an end in itself, modern clinical thinking demands that every intervention be evaluated within a broader therapeutic context, particularly with regard to the patient's long-term prosthetic and implant rehabilitation potential. This paradigm shift has fuelled the development and adoption of instruments specifically designed to minimize surgical trauma and preserve the biological environment of the extraction site.

Among these instruments, the periotome occupies a particularly prominent place. Originally conceived as a refinement of conventional extraction technique, it has since become a symbol of the broader movement toward atraumatic dentistry. Its slender, blade-like working tip is designed to sever the periodontal ligament fibers methodically and selectively, replacing the blunt mechanical forces of classical forceps and elevators with a controlled, tissue-respecting approach.

The growing relevance of the periotome is inseparable from the rise of modern implantology. As immediate and early implant placement protocols have become increasingly prevalent, the quality of the post-extraction alveolar socket has acquired decisive clinical importance. Preserving the osseous and soft tissue architecture at the time of extraction is no longer merely desirable — it is a prerequisite for predictable implant outcomes. The periotome, by enabling surgeons to extract teeth with minimal collateral damage, directly supports this goal.

1.1. Research objective: This article will discuss the principles of periotome operation, their clinical application, and the benefits of using them in daily dental surgical practice, with a focus on the importance of atraumatic extraction techniques in modern implant treatment.

2. Materials and Methods: The purpose of this study is to provide a comprehensive review of the current literature on the use of periotomes in dental surgery and to analyze the design solutions for these instruments available on the market. The study focuses on evaluating the clinical benefits of using periotomes compared to traditional methods and modern piezo-surgical systems.

A review of the literature available in PubMed, Google Scholar, and the databases of manufacturers of specialized medical instruments in English and Polish was conducted. The following search terms were used: “periotome” AND “atraumatic extraction” AND "implant dentistry." The review included original articles, case reports, and literature reviews published mainly after 2017 to ensure the data was up-to-date in accordance with editorial requirements (at least 75% of recent literature).

2.1. AI.

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. AI tools were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

3. State of Knowledge:

3.1 Clinical aspects

Modern dental surgery is undergoing a dynamic shift toward minimally invasive procedures, driven not only by patients' growing expectations regarding treatment comfort, but above all by the need to preserve as much of the patient's own tissue as possible (Sahu et al., 2025). The intact structure of the alveolar bone and soft tissues is the foundation of effective and long-term prosthetic and implant rehabilitation. In this context, every tooth extraction procedure should be viewed not as an isolated procedure, but as a stage in a more complex treatment plan (Sharma et al., 2020).

Traditional tooth extraction techniques, with forceps and levers, although still widely used, involve generating significant luxation forces. These forces, acting on the structures surrounding the tooth, can lead to uncontrolled microtrauma, resorption, or even fractures of thin bone plates, which may complicate implant treatment, often requiring additional augmentation procedures, prolonging the duration of therapy, and increasing its costs (Seeley, 2004; Sharma et al., 2015). The solution to these

challenges was the introduction of tools that enable more precise and controlled surgical procedures. One of the most significant achievements in this area is the periotome — an instrument that has revolutionized the approach to tooth extraction (Seeley, 2004).

Thanks to its slender, sharp working tip, it allows selective severing of the periodontal ligament fibers without the need for excessive mechanical force (Singh et al., 2023). The use of periotomes enables atraumatic extraction, limiting damage to soft and hard tissues to the absolute minimum. Precise separation of the tooth from the surrounding structures makes the procedure safer and more predictable, while significantly reducing the risk of postoperative complications, such as bone resorption or delayed healing (Sharma et al., 2015; Bora et al., 2022). Furthermore, preserving the integrity of the alveolar ridge is crucial for immediate or delayed implantation. It is also worth noting that the development of periotome technology is part of a wider trend toward personalized dental treatment. The availability of various shapes and sizes of working tips allows the operator to select the tool best suited to a specific clinical situation, which further enhances the precision and effectiveness of the procedure (Santhanakrishnan and Gnanaseelan, 2017).

An analysis of clinical data and the literature identifies five key benefits of using periotomes in daily surgical practice:

1. **Atraumatic extraction:** Periotomes drastically reduce the risk of bone and soft tissue damage, which is of fundamental importance for immediate or early implantation planning (Sharma et al., 2015).
2. **Preservation of the alveolar ridge structure:** By minimizing mechanical trauma, the physiological healing process proceeds more rapidly (Bora et al., 2022).
3. **Facilitating implantation:** The use of periotomes increases the chances of preserving the intact cortical bone, improving the initial stability of the implant (Sharma et al., 2020).
4. **Reduction of pain and swelling:** Less damage to surrounding tissues is directly associated with greater patient comfort and lower scores on the Visual Analogue Scale (VAS) (Alraqibah et al., 2022).
5. **Greater precision:** The design allows for controlled separation, particularly useful in extractions of anterior teeth and narrow roots (Seeley, 2004).

According to scientific publications, extractions using periotomes, unlike another technological innovation, piezotomes, result in potentially comparable or more efficient in specific clinical scenarios (Bora et al., 2022; Goyal et al., 2022). Although piezosurgery is valued for its precision, it creates a wider cutting gap and requires cooling, which may affect the rate of early healing (Alraqibah et al.,

2022). During a procedure using a periostome, a shorter procedure duration and a lower degree of pain perception on the VAS scale are observed (Alraqibah et al., 2022; Bora et al., 2022). Furthermore, compared to piezosurgery, the use of a periostome allows for faster healing of the post-extraction wound and is associated with fewer lacerations within the soft tissues (Alraqibah et al., 2022). Studies indicate that the periostome may be a safer and significantly less expensive option for atraumatic extractions (Goyal et al., 2022).

3.2 Analysis of available instruments

Selecting the appropriate periostome model is crucial to the success of the procedure and depends on the tooth's anatomical location and the surgeon's preferences.

Periostome models available on the market and their intended uses:

1. DenMax Periostomes (15.5 cm)



Source: Denmax.pl

Figure. 1. DenMax Periostomes

- A) AG 710-010: A straight, narrow periodontal probe, 1.8 mm wide. Designed for the precise separation of periodontal ligaments in narrow interdental spaces.
- B) AG 710-011: Straight, wide periostome, 2.6 mm wide. Ideal for wider interdental spaces, allowing for atraumatic separation of the tooth from surrounding tissues.

- C) AG 710-012: Curved hockey-stick-shaped periosteal elevator, 1.8 mm wide. Facilitates access to hard-to-reach areas, such as the roots of molars.

2. Dental Set Implant Periosteal Elevator Set



Source: Instrumedic.pl

Figure. 2. Dental Set Implant Periosteal Elevator Set

- A) Type: implant periosteal elevator, luxating
- B) Intended use: root extraction, severing periodontal ligaments
- C) Total length: 15.5 cm

The set consists of seven periosteal elevators with different tip shapes and widths, designed for various surgical procedures:

- A) 3 mm micro-serrated upward-curved bayonet periosteal elevator (Fig. 07 - Pink): Facilitates precise separation of periodontal fibers in the upper oral cavity.
- B) 4 mm curved bayonet-style periosteal elevator (Fig. 09 - Royal Blue): Designed for use in hard-to-reach areas, ensuring effective separation of the tooth from the tissues.
- C) 2.5 mm straight bayonet-style periosteal elevator (Fig. 02 - Green): A versatile tool for most standard extraction procedures.
- D) Straight bayonet-style periosteal elevator, 3.5 mm, with a spear-shaped tip (Fig. 01 - Blue): Provides a larger contact surface, which is advantageous for larger teeth.

- E) Slightly curved 2.5 mm bayonet-style periotome (Fig. 04 - Red): Designed for use in areas with limited operating space.
- F) 3 mm downward-curved bayonet-style periotome (Fig. 06 - Yellow): Ideal for the lower regions of the oral cavity, allowing easier access to tooth roots.
- G) 2.5 mm downward-curved bayonet-style periotome (Fig. 08 - Black): Ensures precise separation of periodontal fibers in the lower regions of the oral cavity.

3. DE-3 Luxating Periotome



Source: Polydent.pl

Figure. 3. DE-3 Luxating Periotome

A periotome with dual tips measuring 3 mm and 1.5 mm in width. A versatile instrument designed for the atraumatic separation of periodontal ligaments before tooth extraction, particularly useful for preserving bone structure and preparing the site for implantation.

- A) Type: implantology periotome, luxating
- B) Total length: standard – total instrument length: 17.5 cm, short – total instrument length: 16.5 cm

Available models:

- A) L-1S (1 mm): for roots of anterior and posterior teeth, mandible and maxilla, for deeply fractured roots and apices, highly atraumatic.
- B) L-2S, S-2S (2 mm): for the roots of anterior and posterior teeth in the mandible and maxilla, and for fractured roots; very atraumatic.
- C) L-3IC (3 mm): for the palatal roots of upper molars, teeth with multiple roots should be sectioned prior to extraction.
- D) L-3C, S-3C (3 mm): for the buccal roots of premolars and molars in the mandible and maxilla— teeth with multiple roots should be sectioned before extraction.
- E) L-3CA, S-3CA (3 mm): for the roots of premolars and molars from the distal side in the mandible – teeth with multiple roots should be sectioned prior to extraction.
- F) L-3S, S-3S (3 mm), L-5S, S-5S (5 mm): for the roots of anterior and posterior teeth in the mandible and maxilla, universal.
- G) L-5C (5 mm): for the roots of lateral and posterior teeth from the buccal side, in the mandible and maxilla.
- H) DE-3 (3 mm / 1.5 mm), DE-5 (5 mm / 3 mm): very atraumatic, for the roots of upper teeth.

4. Perioscalpel (periotome), cross-cut type 1



Source: Polydent.pl

Figure 4. Perioscalpel (periotome), cross-cut type 1

A 17.5 cm long instrument equipped with a cross-cut blade. Designed for atraumatic separation of periodontal fibers during tooth extraction, minimizing damage to soft and bone tissues. The cross-cut blade provides better control and precision during cutting.

5. HINTE Curved Dental Periotome with Micro-serrations



Source: Instrumedic.pl

Figure. 5. HINTE Curved Dental Periotome with Micro-serrations

A 16-cm-long instrument with a 2.5-mm-wide curved tip featuring micro-serrations, designed for the precise separation of periodontal fibers. The curved shape and micro-serrations allow for better penetration and control during the procedure, especially in hard-to-reach areas. Ideal for minimally invasive tooth extractions and implant site preparation.

6. Periotome Set with Interchangeable Blades



Source: Quadrostom.pl

Figure. 6. Periotome Set with Interchangeable Blades

A set consisting of a handle and four interchangeable blades of various shapes and widths. It allows the instrument to be adapted to the specific needs of the procedure, ensuring versatility and cost-effectiveness.

7. DE3 TIN Titanium Periotome



Source: Quadrostom.pl

Figure. 7. DE3 TIN Titanium Periotome

A double-tipped periotome with blade widths of 3 mm and 1.5 mm, coated with titanium. Highly

atraumatic, designed for upper tooth roots. The innovative double-blade allows for probing and tooth displacement with minimal tissue damage.

3.3 Discussion

An analysis of the available scientific literature and a review of modern surgical instruments indicate that periostomes are an essential component of minimally invasive, atraumatic dental surgery. Their use in modern dentistry is part of current clinical standards, thanks to the ability to preserve more tissue during extraction and optimize conditions for subsequent implant and prosthetic treatment. Compared to traditional extraction methods, the use of periostomes significantly reduces the invasiveness of the procedure. Periostomy not only improves the quality of the procedure but also the patient's post-operative comfort. It is also worth noting that periostom is not a universal solution for all procedures in dental surgery. In cases of ankylosis or complex root anatomy, it may be necessary to use supplementary techniques, including root separation or the use of rotary instruments. In summary, periostomes play a key role in modern minimally invasive and atraumatic dental surgery and are an integral part of it.

Table 1. A comparison of the periostomes available on the market, as discussed in the literature review

| Tool / Set Name | Model / Fig. | Tip Width(s) | Total Length | Tip Geometry & Finish | Handle & Ergonomics | Clinical Advantage | Best For |
|------------------------|---------------------|---------------------|---------------------|----------------------------------|--------------------------------|-------------------------------|---------------------------------|
| DenMax Series | AG 710-010 to 012 | 1.8 mm - 2.6 mm | 15.5 cm | Straight or Hockey-stick | Standard solid handle | High precision in narrow gaps | Interdental ligament separation |

| | | | | | | | |
|-----------------------------------|--------------|-----------------|---------|-------------------------------|--------------------------|---|-------------------------------|
| Implant Set (Pink) | Fig. 07 | 3.0 mm | 15.5 cm | Upward-curved, Micro-serrated | Color-coded (Pink) | Increased grip on fibers due to serration | Upper jaw (Maxilla) |
| Implant Set (Blue) | Fig. 09 | 4.0 mm | 15.5 cm | Wide bayonet, Curved | Color-coded (Royal Blue) | Functions as a periosteal elevator | Hard-to-reach posterior areas |
| Implant Set (Green) | Fig. 02 | 2.5 mm | 15.5 cm | Straight bayonet | Color-coded (Green) | High tactile feedback | Standard, routine extractions |
| Implant Set (Spear) | Fig. 01 | 3.5 mm | 15.5 cm | Spear-shaped tip | Color-coded (Blue) | Increased surface contact | Large teeth / Molars |
| Implant Set (Yellow/Black) | Fig. 06 / 08 | 2.5 mm - 3.0 mm | 15.5 cm | Downward-curved bayonet | Color-coded | Ergonomic access to lower arch | Lower jaw (Mandible) |
| Luxating Series (L/S) | L-1S | 1.0 mm | 17.5 cm | Ultra-thin, straight | Long ergonomic handle | Maximum bone preservation | Deeply fractured roots/apices |

| | | | | | | | |
|-------------------------------|------------------|--------------|----------------|------------------------------|------------------------------|---------------------------------|------------------------------|
| | | | | | | n | |
| Luxating Series (L/S) | L-3C / S-3C | 3.0 mm | 17.5 / 16.5 cm | Curved blade | Available in Long or Short | Optimized for buccal access | Premolars and Molars |
| Luxating Series (L/S) | L-3CA / S-3CA | 3.0 mm | 17.5 / 16.5 cm | Distal-angled | Long or Short versions | Access to distal side of roots | Mandibular posterior teeth |
| Luxating Series (Dual) | DE-3 / DE-5 | 1.5 - 5.0 mm | 17.5 cm | Double-ended (Dual tip) | Multi-functional single tool | Time-saving during surgery | General implantology prep |
| Perioscalpel | Cross-cut Type 1 | Variabl e | 17.5 cm | Cross-cut blade edge | Surgical precision handle | Controlled, sharp fiber cutting | Minimal soft tissue trauma |
| HINTE Periotome | Curved Serrated | 2.5 mm | 16.0 cm | Curved with Micro-serrations | Premium ergonomic | Superior penetration power | Minimally invasive site prep |

| | | | | | | | |
|----------------------------|------------------|-----------------|-----|--------------------------|---------------------------|-----------------------------------|---------------------------------|
| Interchangeable Set | Modular | 4 shapes | N/A | Removable blades | Universal screw-on handle | High versatility / Cost-efficient | Practices with varied caseloads |
| DE3 TIN | Titanium Edition | 1.5 mm / 3.0 mm | N/A | Titanium Nitride Coating | Double-ended, Gold-tone | Reduced friction, high durability | Probing & luxation in Maxilla |

4. Conclusions: Periotomes are indispensable tools in the arsenal of the modern dental surgeon seeking to preserve alveolar bone volume. Their advantage over traditional methods stems from the elimination of bone-crushing forces and over piezo-surgical methods, from their lower biological invasiveness and cost-effectiveness. The regular use of periotomes in pre-implant extractions is now becoming the standard of care, ensuring optimal conditions for healing and subsequent rehabilitation.

Disclosure.

Conceptualization, Natalia Smoczyńska; methodology, Natalia Wdowiak; software, Ewa Jachimczuk; check, Natalia Wdowiak, Natalia Smoczyńska and Gabriela Czerepak; formal analysis, Katarzyna Bednarz and Gabriela Czerepak; investigation, Paulina Jaruga; resources, Natalia Smoczyńska; data curation, Natalia Wdowiak; writing - rough preparation, Natalia Smoczyńska and Paulina Jaruga; writing - review and editing, Natalia Wdowiak; visualization, Ewa Jachimczuk; supervision, Natalia Smoczyńska and Natalia Wdowiak; project administration, Katarzyna Bednarz, Gabriela Czerepak; receiving funding- no funding has been received. All authors have read and agreed with the published version of the manuscript.

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