

Surgical Contributions of Abū al-Qāsim al-Zahrāwī (Albucasis) in *Al-Taṣrīf*: A Narrative Historical Review

Dr. Asma Mohammad Tahir^{1*}, Prof. Abdul Quavi², Dr. Sanu Babu³, Dr. Aqsa Mohd Tahir⁴

¹Postgraduate Scholar Department of Ilmu Jarahat (Surgery, a Specialty within Unani Medicine), State Takmil-ut-Tibb College and Hospital, Lucknow, Uttar Pradesh (UP), India (Affiliated with Mahayogi Guru Gorakhnath Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homoeopathy [AYUSH] University, Gorakhpur)

²Head of Department, Principal Department of Ilmu Jarahat (Surgery), State Takmil-ut-Tibb College and Hospital, Lucknow, UP, India

³Postgraduate Scholar Department of Tashrīḥ-ul-Badan (Anatomy, a specialty within Unani medicine), State Takmil-ut-Tibb College and Hospital, Lucknow, UP, India

⁴Postgraduate Scholar Department of Mahiyatul Amraz (Pathology), State Unani Medical College and Hospital, Prayagraj, UP, India

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*Corresponding author: Dr. Asma Mohammad Tahir

Postgraduate Scholar Department of Ilmu Jarahat (Surgery, a specialty within Unani medicine), State Takmil-ut-Tibb College and Hospital, Lucknow, Uttar Pradesh (UP), India (Affiliated with Mahayogi Guru Gorakhnath Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homoeopathy [AYUSH] University, Gorakhpur)

Abstract

Review Article

Background: Although al-Zahrāwī's contributions to medical history are widely acknowledged, modern literature often fragments discussions regarding the specific pedagogical mechanics of his work. **Objective :** To provide a focused thematic analysis of the 30th volume of *Al-Taṣrīf*, elucidating how its detailed instrument design and stepwise procedural documentation offered a foundational blueprint for surgical instruction. **Methods:** A narrative historical review was employed for an in-depth qualitative exploration. Primary data were sourced from the highly acclaimed 1973 Spink and Lewis English translation. To mitigate interpretive bias, findings were systematically cross-referenced with contemporary peer-reviewed historical analyses to validate technical translations and confirm the broader historical context. **Findings:** Our analysis demonstrates that al-Zahrāwī established a systematic methodological framework that integrated patient positioning, specialized site-specific instrumentation, and stepwise intraoperative guidance. This structured approach served as an early structural precursor to the elements found in modern operative reporting across diverse domains. **Conclusion:** This review systematically elucidates how the 30th volume of *Al-Taṣrīf* functioned as a pivotal pedagogical masterwork. By successfully integrating theoretical anatomy with practical applications, it provided a foundational blueprint for surgical education; however, its comparison to modern practice must be carefully contextualized within the scientific limitations of the 10th century.

Keywords: Albucasis, Abū al-Qāsim al-Zahrāwī, *Al-Taṣrīf*, History of surgery, Islamic medicine, Surgical instruments.

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1. INTRODUCTION

This paper presents a narrative historical review of Abū al-Qāsim Khalaf ibn al-'Abbās al-Zahrāwī's (known to the West as Albucasis) thirtieth volume of *Al-Taṣrīf liman 'ajiza 'an al-ta'rif (Al-Taṣrīf)*. Practicing in the Umayyad Caliphate of Córdoba (al-Andalus) during the 10th century, al-Zahrāwī compiled his life's work into a thirty-volume medical compendium. Although his contributions are widely acknowledged, a focused analysis specifically elucidating the detailed pedagogical mechanics of the thirtieth volume particularly regarding specific instrument design and stepwise procedural documentation offers a nuanced perspective not always comprehensively synthesized in broader historical accounts [1, 10, 20].

Translated into Latin by Gerard of Cremona in the 12th century, *Al-Taṣrīf* dominated European medical curricula for over five centuries [2, 3]. Although its status as a landmark independent surgical manual is well-established, the specific ways in which its pedagogical principles have structured subsequent surgical education warrant closer examination [2, 15]. This review aims to highlight how al-Zahrāwī's formalized approach to surgical vocabulary and instrumentation provided a foundational blueprint for structured surgical documentation. Specifically, we explore its foundational elements that serve as structural precursors to components found in modern operative reports, while critically acknowledging the inherent differences in context, scientific understanding, and purpose between

medieval instructional texts and contemporary medico-legal documentation.

2. METHODS

A narrative historical review methodology was employed for an in-depth qualitative exploration of the 30th volume of *Al-Taṣrīf*. To ensure a robust interpretive analysis while mitigating bias, we conducted a systematic search of peer-reviewed literature (e.g., PubMed, Google Scholar) using keywords such as "Albucasis," "Al-Taṣrīf," "history of surgery," and "Islamic medicine."

Primary data were sourced predominantly from the highly acclaimed 1973 English translation by Spink and Lewis [6]. While this translation is renowned for its scholarly rigor, we acknowledge that interpretations are filtered through a translated text. To mitigate potential interpretive biases, we systematically cross-referenced specific technical terms with a selection of prominent secondary historical analyses [1, 5, 10, 15]. For instance, when evaluating metallurgical terms regarding cautery irons, cross-referencing with secondary medical history literature clarified the clinical intent behind his "red-hot" versus "white-hot" applications, ensuring that our pedagogical claims were rooted in an accurate historical context rather than translation artifacts.

Our thematic analysis involved an independent iterative review by two authors (AMT and SB) to identify recurring pedagogical frameworks, such as step-by-step instructional formatting and anatomical prerequisites. Following this initial analysis, specific procedures for detailed discussion were systematically selected based on two primary criteria: (1) demonstrable relevance to contemporary surgical specialties and (2) the presence of extensive, highly detailed descriptions within *Al-Taṣrīf*. For example, while the text briefly mentions superficial cautery for localized pain, this was excluded in favour of procedures like perineal cystolithotomy, which features explicit step-by-step instructions and detailed instrument prerequisites that best illustrate his pedagogical method.

3. THE ARCHITECTURE OF THE THIRTIETH VOLUME

Al-Zahrāwī organized his surgical discourse into three distinct sections (*abwāb*), moving logically from the least to the most invasive techniques:

3.1 Cauterization

This section (56 chapters) details the use of thermal energy for therapeutic purposes across diverse pathologies [6, 10].

3.2 General Operative Surgery

This section (93 chapters) covers incisions, perforations, bloodletting, wound management, and complex soft-tissue procedures [6, 21].

3.3 Orthopedics

This section (35 chapters) focuses on the reduction of fractures, bone setting, and the management of joint dislocations [4, 6].

This logical progression underscores al-Zahrāwī's systematic approach to surgical education, which guides learners from fundamental interventions to highly complex operative procedures.

4. TECHNICAL FINDINGS AND OPERATIVE PRINCIPLES

4.1 Instrumentation: Beyond Simple Tools

Al-Zahrāwī's most enduring legacy is his catalog of over 200 surgical instruments [6, 18]. He moved beyond the generic, multipurpose tools documented in earlier Greek and Byzantine traditions, such as the compilations by Paul of Aegina, by designing highly specific, site-directed instruments. Notable examples include an early iteration of the vaginal speculum, crushing forceps for lithotomy (*kalālīb*), and specialized scalpels for ophthalmic work [6, 19]. His strict insistence on providing accurate illustrations functioned as an early form of standardization, ensuring that these tools could be replicated by artisans across different geographic regions with high fidelity.

4.2 Cauterization and Hemostasis

Al-Zahrāwī formalized the use of thermal cautery, preferring it over chemical caustics due to its superior control over tissue depth and margin. He precisely distinguished between "red-hot" (coagulative) and "white-hot" (excisive) applications, basing his preference for iron over gold or copper on its superior heat retention properties [4, 6]. For hemostasis, he documented a multimodal approach including digital pressure, styptics, and vascular ligation, systematically shifting hemorrhage control from an ad hoc emergency response to a planned operative step [5, 6].

4.3 General and Reconstructive Surgery

Al-Zahrāwī's detailed descriptions exemplify an innovative approach to patient-specific reconstructive care.

4.3.1 Gynecomastia

He described a technique for male breast reduction utilizing a site-specific C-shaped incision to facilitate the excision of glandular and adipose tissue while actively considering cosmetic outcomes, demonstrating formalized aesthetic awareness [6, 7].

4.3.2 Varicose Veins

His approach to managing venous insufficiency recommended limb preparation (warming and exercise) followed by a longitudinal incision and segmental excision using blunt hooks and spatulas to prevent recurrence a clearly structured, multi-phase operative plan [6, 12].

4.3.3 Ophthalmic and Facial Reconstruction

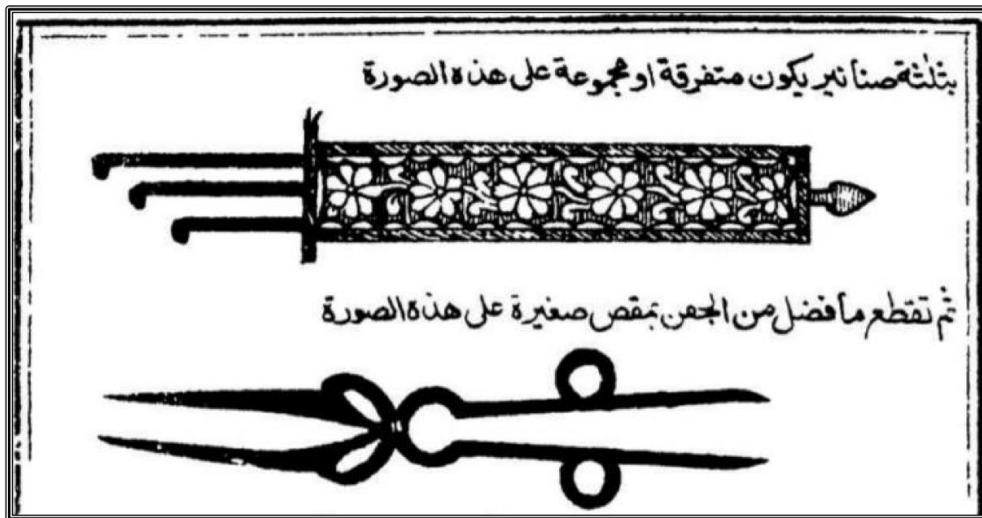


Figure 1: The hooks and scissors Al-Zahrawi used in eyelid surgery [5]

He detailed the correction of entropion and ectropion using precise leaf-shaped or triangular skin excisions and described primary closure techniques for cleft lips to minimize scarring [5, 16].

4.4 Specialty Interventions: Formalizing the Stepwise Approach

His emphasis on stepwise instruction is evident in his specialty procedures.

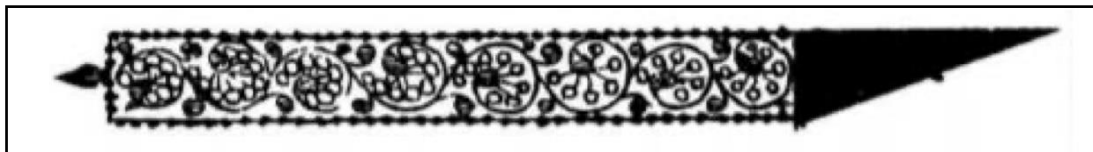


Figure 2: The knife Al-Zahrawi invented for the Hypospadias [5]

4.4.1 Urology and Pediatrics

He refined perineal cystolithotomy" for bladder stones by introducing a metal probe (*al-mirwād*) for definitive localization *prior* to incision and extraction [6, 8]. This diagnostic-before-therapeutic sequence remains

a hallmark of structured surgical algorithms. He also pioneered pediatric reconstructive techniques for hypospadias and imperforate meatus [22].

4.4.2 Otorhinolaryngology

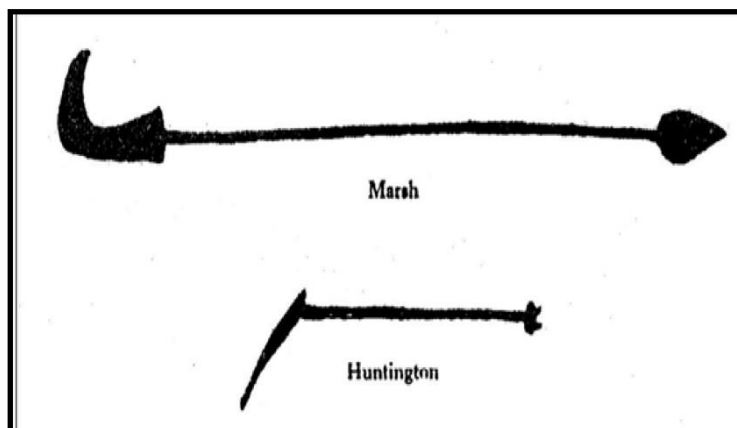


Figure 3: Scalpel for Tonsillectomy [6,9]

He documented a "laryngotomy" (tracheostomy) to alleviate severe upper airway obstruction, explicitly advising an incision between the tracheal rings [6]. This interpretation of his anatomical

precision is corroborated by secondary analyses validating his understanding of avoiding cartilaginous structures [9, 17].

4.4.3 Neurosurgery and Trauma

His manual provided foundational observations regarding skull fractures and spinal injuries, often detailing specific sequential steps for diagnosis and intervention rather than merely theoretical discourse [11, 13, 14].

5. DISCUSSION

The thirtieth volume of *Al-Taṣrīf* represents a monumental paradigm shift in medical literature. Unlike earlier texts, such as those by Paul of Aegina, which often treated surgery as a secondary adjunct or a last resort to pharmacology, al-Zahrāwī elevated it to an independent, practical discipline requiring deep anatomical mastery.

His descriptions provided a blueprint that allowed operative surgery to be taught systematically. The formalized methodology evident in his writings closely mirrors the key structural precursors of the modern operative report: explicit preoperative considerations, structured patient positioning, precise instrument selection, and step-by-step procedural documentation.

However, a critical analysis must contextualize these precursors. Although structural analogies are evident, it is crucial to avoid anachronism. The modern operative report serves explicit medico-legal, billing, and outcome-tracking functions that were entirely absent in the 10th century. Furthermore, while *Al-Taṣrīf* stands as a testament to al-Zahrāwī's empirical genius, the absence of germ theory meant that postoperative infection remained a misunderstood challenge, and his understanding of internal physiology was necessarily rudimentary compared to modern science. Acknowledging what is absent from his work such as detailed vital tracking or modern consent frameworks does not diminish his legacy; rather, it highlights the remarkable achievement of his systematic approach despite the inherent constraints of medieval medicine.

6. LIMITATIONS

This narrative historical review has some methodological limitations. Primarily, our reliance on the 1973 English translation of *Al-Taṣrīf* dictates that interpretations are filtered through a translated text. While mitigated through cross-referencing, this may inadvertently obscure subtle nuances of the original 11th-century Arabic terminology.

Second, narrative reviews inherently involve selective interpretation. To mitigate authorial bias, we established explicit selection criteria for the procedures discussed, prioritizing those with extensive instructional descriptions. Finally, attributing direct causality across centuries is difficult; while our comparisons highlight foundational precursors, we do not assert absolute modern equivalence, acknowledging the complex, multifaceted evolution of surgical practice.

7. CONCLUSION

This review systematically elucidates how Abū al-Qāsim al-Zahrāwī's thirtieth volume of *Al-Taṣrīf* functioned as a pivotal pedagogical masterwork. By formalizing surgical instrumentation and establishing a rigorous, stepwise methodology for complex procedures, al-Zahrāwī provided a foundational blueprint whose influence catalyzed the development of surgical education throughout the medieval Islamic world and subsequently the European Renaissance, even when viewed through the critical lens of historical scientific limitations.

Declarations:

Conflict of Interest: None declared.

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Ethical Approval: Not required for historical textual research.

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