Rib Remodeling Surgery: An Integrative Review

Cirurgia de remodelamento costal: Revisão integrativa

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Abstract

Introduction Body-contouring procedures are increasingly popular to enhance physical appearance. However, waist narrowing may be limited in patients with a broad thorax, requiring additional techniques to achieve better outcomes.

Objective The current study aimed to identify the main consistent aspects among rib-remodeling techniques, evaluating their efficacy, safety, and impact on patient satisfaction.

Materials and Methods The present integrative review analyzed studies published English, Portuguese, and Spanish in the last 5 years in the PubMed, Cochrane, LILACS, and SciELO databases that addressed esthetic rib-remodeling techniques.

Results and Discussion The selected studies focused on ultrasound-guided procedures that enhance precision and safety, along with the rib osteosynthesis surgery (RIBOSS) technique, which provides structural stability and promotes better recovery. Although reports indicate high satisfaction and low complication rates, gaps remain regarding the standardization of success criteria, long-term evaluation, and control of associated variables. The integration of advanced technologies appears promising, but it depends on factors such as cost and professional training.

Conclusion Despite the advancements, the literature lacks rigorous and standardized studies assessing the long-term efficacy and safety of rib remodeling, underscoring the need for protocols that consider clinical outcomes and the patient's perspective.

Keywords
- ribs
- rib fractures
- surgery, plastic
- plastic surgery procedures
- esthetics

Resumo

Introdução Os procedimentos de contorno corporal são cada vez mais populares por melhorarem a aparência física, mas o estreitamento da cintura pode ser limitado em pacientes com tórax largo, o que requer técnicas adicionais para a obtenção de resultados melhores.

Objetivo Identificar as principais relações entre as técnicas de remodelação costal, e avaliar sua eficácia, segurança e impacto na satisfação dos pacientes.

Materiais e Métodos Esta revisão integrativa analisou estudos publicados nos últimos 5 anos nas bases de dados PubMed, Cochrane, LILACS e SciELO, incluindo artigos publicados em inglês, português e espanhol que abordassem técnicas estéticas de remodelação das costelas.

Palavras-chave
- costelas
- fraturas das costelas
- cirurgia plástica
- procedimentos de cirurgia plástica
- estética

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Resultados e Discussão Os estudos selecionados destacam procedimentos guiados por ultrassom que aumentam a precisão e segurança, além da técnica de cirurgia de osteossíntese da costela (*rib osteosynthesis surgery*, RIBOSS, em inglês), que proporciona estabilidade estrutural e boa recuperação. Embora os relatos indiquem alta satisfação e baixa incidência de complicações, há lacunas quanto à padronização dos critérios de sucesso, à avaliação de longo prazo e ao controle de variáveis associadas. A integração de tecnologias avançadas mostra-se promissora, mas depende de fatores como custo e capacitação.

Conclusão Apesar dos avanços, a literatura carece de estudos rigorosos e padronizados que avaliem a eficácia e segurança do remodelamento costal no longo prazo, o que ressalta a necessidade de protocolos que considerem tanto os desfechos clínicos quanto a perspectiva do paciente.

Introduction

Body-contouring procedures have gained increasing popularity worldwide due to their ability to enhance physical appearance and provide the desired body shape. Among the most performed interventions, liposuction stands out as the leading technique, followed by breast augmentation, blepharoplasty, and abdominoplasty.[1] However, despite the effectiveness of these procedures, waist narrowing may be limited, particularly in patients with a broad thorax, who may require additional interventions to achieve satisfactory outcomes.[2,3]

This context has led to the development of innovative surgical techniques aimed at waist remodeling, including osteotomy and resection of the floating (11th and 12th) ribs. Although removal of these ribs may significantly reduce waist circumference and yield high patient satisfaction, the procedure is invasive and associated with considerable perioperative risks, such as pneumothorax, infections, and nerve injury, in addition to loss of the natural bony protection of internal organs.[2–5]

Additionally, advancements in technology have improved procedural accuracy by enabling intraoperative monitoring of fracture angulation, which helps reduce complications. These innovations reflect the growing interest in less invasive approaches that promote a thinner, more harmonious waist while meeting esthetic expectations with improved safety.[2–5]

Objective

This study aimed to identify, through an integrative review, the main consistent aspects among existing research on rib-remodeling techniques and to evaluate the methodological quality of the available publications. The study also aims to analyze the effectiveness, safety, and impact on patient satisfaction of these techniques, while emphasizing the need for more robust research to ensure long-term safety and quality of outcomes.

Materials and Methods

We conducted a literature search on the PubMed, Cochrane, LILACS, and SciELO databases using specific terms such as *rib remodeling* and *plastic surgery*, combined with Boolean operators. We included articles published in the last 5 years in English, Portuguese, and Spanish to ensure the evidence is current and relevant.

The inclusion criteria were primary studies, systematic reviews, clinical trials, observational studies, and case reports on esthetic rib-remodeling techniques and their outcomes in plastic surgery. We excluded articles that did not directly address the topic, as well as duplicate publications, editorials, letters to the editor, and opinion papers.

Study selection was performed in two stages: initial screening of titles and abstracts, followed by full-text review of the articles that met the inclusion criteria. Two independent reviewers, unaware of the authors' identities and institutional affiliations, conducted the selection process. A third reviewer resolved disagreements to ensure methodological rigor.

We extracted data using a standardized form including information on study design, sample characteristics, interventions performed, evaluated outcomes, and main findings.

Results

Cipriani et al.[3] (2023) investigated an incisionless waist-remodeling technique using ultrasound-guided monocortical rib fracture. The study demonstrated that the procedure is safe, minimally-invasive, and results in satisfactory esthetic outcomes, with high patient satisfaction and nearly imperceptible scarring.

Cipriani[4] (2024) evaluated the effectiveness of ultrasound-guided rib remodeling and discussed the relevance of the "clack" (fracture) sound as an indicator of procedural success. The study reinforced the safety of the technique and highlighted the precision provided by ultrasound for intraoperative monitoring.

Villa et al.[2] (2025) described the rib osteosynthesis surgery (RIBOSS) technique, which combines esthetic rib-cage remodeling with osteosynthesis to achieve high-definition body contouring. This recently-published study demonstrated enhanced esthetic outcomes, good structural stability, and appropriate recovery. The authors presented the

Table 1 Summary of the studies included in the review

Author and year	Study type	Population (n) and gender	Outcomes evaluated	Main results
Cipriani et al.[3] (2023)	Observational	Not specified, presumably women	Effectiveness, safety, and satisfaction	Safe, minimally-invasive technique, high satisfaction
Cipriani[4] (2024)	Descriptive	Not specified	Precision of the procedure and safety	Ultrasound increases precision; "clack" indicates success
Villa et al.[2] (2025)	Clinical	Not specified	Esthetic results, stability, and recovery	RIBOSS technique is effective and provides good stability and recovery
Valdivieso et al.[5] (2024)	Observational	Not specified	Safety, esthetic results, and complications	Low complication rate, high satisfaction, planning is essential

Abbreviation: RIBOSS, rib osteosynthesis surgery.

technique as an effective and safe alternative for rib remodeling, with low complication rates and high patient satisfaction.

Valdivieso et al. (2024) analyzed rib remodeling with emphasis on esthetic outcomes and safety. Their findings supported the effectiveness of minimally-invasive techniques, reporting low complication rates and high patient satisfaction, while underscoring the importance of detailed surgical planning ►**Table 1**.

Ethical Considerations

Since the current integrative review used publicly-available secondary data with no direct involvement of human subjects, it is exempt from requiring ethical approval. However, we ensure integrity in the citation of sources and transparency in the conduction of the review.

Discussion

Rib-remodeling techniques for waist contouring have gained prominence by offering less invasive alternatives and presenting the potential for significant esthetic improvement. Among the few studies published in the past 5 years, most aimed to introduce and describe new surgical techniques rather than provide high-level evidence of their efficacy and safety.

In the studies included in the present review, the most frequently investigated approach involved the use of intraoperative ultrasound to enhance procedural precision. Ultrasound monitoring improved the accuracy of monocortical rib fractures, reduced procedural risks, and increased surgical safety. Furthermore, this technology may help standardize interventions, which is crucial to ensure methodological reproducibility and enable the objective assessment of outcomes.

Villa et al.[2] made a significant contribution to the field by presenting the RIBOSS technique, which combines esthetic rib-cage remodeling with osteosynthesis using titanium plates. This strategy provides greater structural stability and improved postoperative comfort. The authors demonstrated the possibility of obtaining enhanced esthetic outcomes with shorter immobilization time and reduced impact on daily activities, potentially increasing patient adherence and satisfaction.

Despite these reported benefits, the literature still presents important gaps. The absence of uniform criteria to define surgical success—illustrated by the variability in detecting the characteristic fracture sound—highlights the need for more rigorous and integrated protocols that combine clinical indicators with technological parameters. Furthermore, most studies focus on short- to mid-term outcomes, leaving unanswered questions regarding the durability of results and the incidence of late complications.

Another relevant limitation involves sample heterogeneity and insufficient control of confounding variables, such as concomitant procedures (such as liposuction), individual patient characteristics, and associated surgical techniques. This variability limits generalizability and reinforces the need for future studies with more robust designs, including control groups and randomization.

While patient satisfaction is frequently reported as high, studies seldom utilize standardized or validated assessment tools, undermining comparability across investigations. Moreover, psychosocial aspects and quality-of-life outcomes related to body image and self-esteem remain underexplored, despite their key role in esthetic surgery.

Regarding safety, the reported complications are often mild and transient; however, consistent long-term data on adverse events remain scarce. Such evidence is essential to support the consolidation of these techniques into routine clinical practice.

Lastly, integration of advanced technologies—such as three-dimensional (3D) computed tomography for preoperative planning, the ultrasonic Piezotome (Acteon Group) device, and titanium plate osteosynthesis—appears promising in enhancing surgical precision and esthetic outcomes.

Widespread adoption relies on factors such as availability, cost, and surgeon training, which must be considered when developing clinical guidelines.

Conclusion

The present review highlights the need for more rigorous and well-designed studies on waist remodeling through rib-fracture techniques, as most current publications present methodological limitations that compromise the reliability of their findings. Future investigations should adopt strict protocols, include control groups, and provide detailed outcome analyses—particularly in combined procedures—to clearly establish the technique's efficacy and safety. In addition, incorporating patient perspectives through validated assessment tools is essential to develop protocols that safely and effectively address esthetic and functional expectations.

Data Availability

Data will be available upon request to the corresponding author.

Authors' Contributions

JLM, JS, and MLVP: writing – original draft and writing – review & editing; and MC: supervision.

Clinical Trials

None.

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Conflict of Interests

The authors have no conflict of interests to declare.

References

1 International Society of Aesthetic Plastic Surgery (ISAPS). Global Survey 2021 [Internet]. Mount Royal, NJ: ISAPS; 2023. Disponível em: https://www.isaps.org/discover/about-isaps/global-statistics/reports-and-press-releases/global-survey-2021-full-report-and-press-releases/#:~:text=The%20report%20shows%20a%20continuing,in%20the%20last%20four%20years
2 Villa HA, Villabona-Florez SJ, Hoyos AE, Pachon MEP, Serrano-Reyes HM, Sandoval CJD. Aesthetic Rib Cage Remodeling with Osteosynthesis: Body Structural High-Definition Reshaping (Rib Osteotomy with Osteosynthesis Stabilization). Plast Reconstr Surg 2025;155(02):279–288. Doi: 10.1097/PRS.0000000000011512
3 Cipriani RMM, Vega HD, Uribe LC, Viaro M, Adrianzen GA, Botelho DL. Waist remodeling without incision, with ultrasound-guided monocortical fracture. Plast Reconstr Surg Glob Open 2023;11(12):e5499. Doi: 10.1097/GOX.0000000000005499
4 Cipriani RMM. Is "clack" enough? Rib remodeling guided by ultrasound. Plast Reconstr Surg Glob Open 2024;12(05):e5843. Doi: 10.1097/GOX.0000000000005843
5 Valdivieso CO, Valdivieso DO, Hoyos AE, et al. ltrasonic- and Ultrasound-assisted Improvement of Silhouette of the Torso: Bone Structure High-definition Remodeling (Part I). Plast Reconstr Surg Glob Open 2024;12(01):e5513. Doi: 10.1097/GOX.0000000000005513