

ORIGINAL RESEARCH ARTICLE

Rib removal in body contouring surgery and its influence on the waist

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Abstract

Objective: While modern cosmetic surgery allows patients to be offered less invasive and bloody procedures than before, there are cases where these are not sufficient to give the results that meet patients' expectations, especially in the case of the upper region of the abdomen. The purpose of this study is to describe the 11th and 12th rib removal technique as body contouring surgery in patients for whom traditional surgery would not have reached the desired results.

Materials and methods: A case series study is presented, describing the surgical records of patients who underwent 11th and 12th rib removal for aesthetic purposes, with or without other elective cosmetic surgeries.

Results: A total of 104 women who underwent costal resection surgeries during a period of 8 years were identified. Only 10 of these patients underwent rib removal exclusively, being the most common combination of procedures liposuction and rib removal. The average age was 29, 39 at the time of surgery, and two pneumothorax were the only transoperative complications presented.

Conclusions: The 11th and 12th rib removal is a not-gory technique with a low complication rate.

Keywords: *waist narrowing; body contour; rib removal; liposuction; waist shaping*

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The main purpose of aesthetic surgery is to achieve pleasant results that meet patients' and doctors' expectations, always based on realistic goals, which are dictated by cultural regions, ethnic groups, and established social concepts. There are cases in which, after performing conventional body contouring procedures, modifying fat, muscle, and skin (i.e. liposculpture and tummy tuck), the desired results are not achieved. Therefore, we must begin to take into account bone structure, a component that up to now has not been considered a determining factor in the outcome of body contouring surgery (i.e. modifying the rib cage by removing 11th and 12th ribs).

This technique's purpose is to achieve a more feminine and forceful result, in patients for whom traditional techniques do not meet or did not meet the desired goals.

Body contouring surgical procedures have a high satisfaction rate with life in general, with body appearance and improvements in health perception (1, 2). While modern cosmetic surgery allows less invasive and gory procedures than their predecessors, there are cases in which these are not sufficient to give the results that meet patients' expectations, especially regarding the upper abdomen region (3).

Region anatomy

Ribs XI and XII are articulated only with the bodies of their own vertebrae and have no tubers or neck, earning the name of 'floating ribs'. Both ribs are short, have a low curvature, and a pointed anterior end (4).

The 11th and 12th rib bed is composed of three layers: internal periosteum, endothoracic fascia, and parietal pleura. The 11th rib is covered by the latissimus dorsi and the anterior serrate along their respective fascias and the superficial periosteum, in addition to some fibers of the external and internal obliques and the transverse abdominal muscle. The 12th rib is covered by the latissimus dorsi and the posterior serrated. It is noteworthy that the lower edge of the rib has an intimate relationship with the nerve and subcostal vessels (5). The diaphragm is inserted in the rib cartilage of the 11th and 12th ribs.

The 12th rib has a close relationship with the pleura, which varies according to its length, association described by Myney and Hughes, who established a closer relationship in short ribs (<6 cm, the pleura covers the entire inner surface of the rib, being placed directly under the rib bed in its entire length) compared to long ribs (11–14 cm) (5).

Anatomical determinants of body shape

The body contour is determined by the distribution of adipose tissue and axial skeleton shape, both factors intimately related to the individual hormonal profile. Therefore, there are important differences between the female and male axial skeleton. The female torso is significantly narrower in the lower area creating a characteristic hour-glass illusion, unlike the square characteristic of the male chest (6).

The waist extends from 7 to 10 cm between the lower rib and the iliac crest, and its shape is determined by the upper opening of the pelvis. Meaning, a wide pelvis produces a more accentuated waist. In cases where the pelvis is small, the distance between the pelvis and the rib arc is narrow, or when there is an adiposity excess, the waist may be completely absent. In patients with previous record of obesity, waist definition is almost impossible due to the expansion of the rib cage secondary to obesity, resulting in deformity similar to the barrel chest (7).

Materials and methods

A case series study is presented, describing the surgical records of patients who underwent 11th and 12th ribs removal for aesthetic purposes, with or without other elective cosmetic surgeries, by a plastic surgeon in Culiacán, Sinaloa, between 2012 and 2020, where age, sex, performed surgery, and transoperative complications were recorded.

For the surgery, patients were placed in lateral decubital, aligning the waist to the axis of the table. In order to perform the subperiostic rib removal, an incision of 2.5 cm was made behind the posterior axillary line (Fig. 1), following the lower edge of the 11th rib and forming an acute angle between the incision line and the posterior axillary line. An incision of subcutaneous cell tissue was made, respecting the muscle fascia. A layered dissection was performed on the outer face of the rib, avoiding the intercostal area. For muscle avulsion, the aponeuretic fascia was taken with Adson forceps, and an atraumatic dissection was executed in the direction of the muscle fibers. When the periosteum was on sight, we began lateral and medial avulsions of the muscles until wide visualization of the rib was achieved (Fig. 2a, b). The periosteum was elevated by 7 mm chisel snuff until deperiostization of the exposed surface.

The tip of the Duyan was introduced into the free space that was formed by raising the periosteum, directing the point toward the rib body. Medial and lateral movements allowed dissection of the posterior periosteum.

In order to proceed with the rib removal, a notch with gouge was made (Fig. 3). The anterior segment was taken by the side edge, slightly tracing and removing the periosteum remnants with a chisel, until the cartilage was visualized, and finally, a new notch was made to cut the



Fig. 1. 2.5 cm incision. The orifice above is from the liposuction's approach port.

rib. These same steps were followed to remove the anterior segment. Throughout the procedure, excessive use of cautery was avoided (Figs. 4–7).

Once the pleural integrity was verified, the incision was pulled up to the 12th rib, behind the posterior axillary line, and the rib was removed. For the extraction of the 12th rib, multiple grimaces with gauge were made. Hemostasia and layered suture were performed, stitching muscle aponeurosis, subcutaneous cell tissue, and dermis with absorbable sutures.

In cases where abdominoplasty + rib removal was performed, the 10th ribs were fractured with the same single approach as the resections of the 11th and 12th ribs. In order to do so, flexibility of the skin is required, which favors patients with no previous liposuctions, where there is no presence of fibrous or fibrous tissues that limit the flexibility of the skin and, thus, be able to move the approach at the level of the 10th rib.

When the anterior aspect of the 10th rib is reached, the muscles are carefully resected, until the periosteum, anterior aspect, and ridges of the 10th rib are concisely elevated.

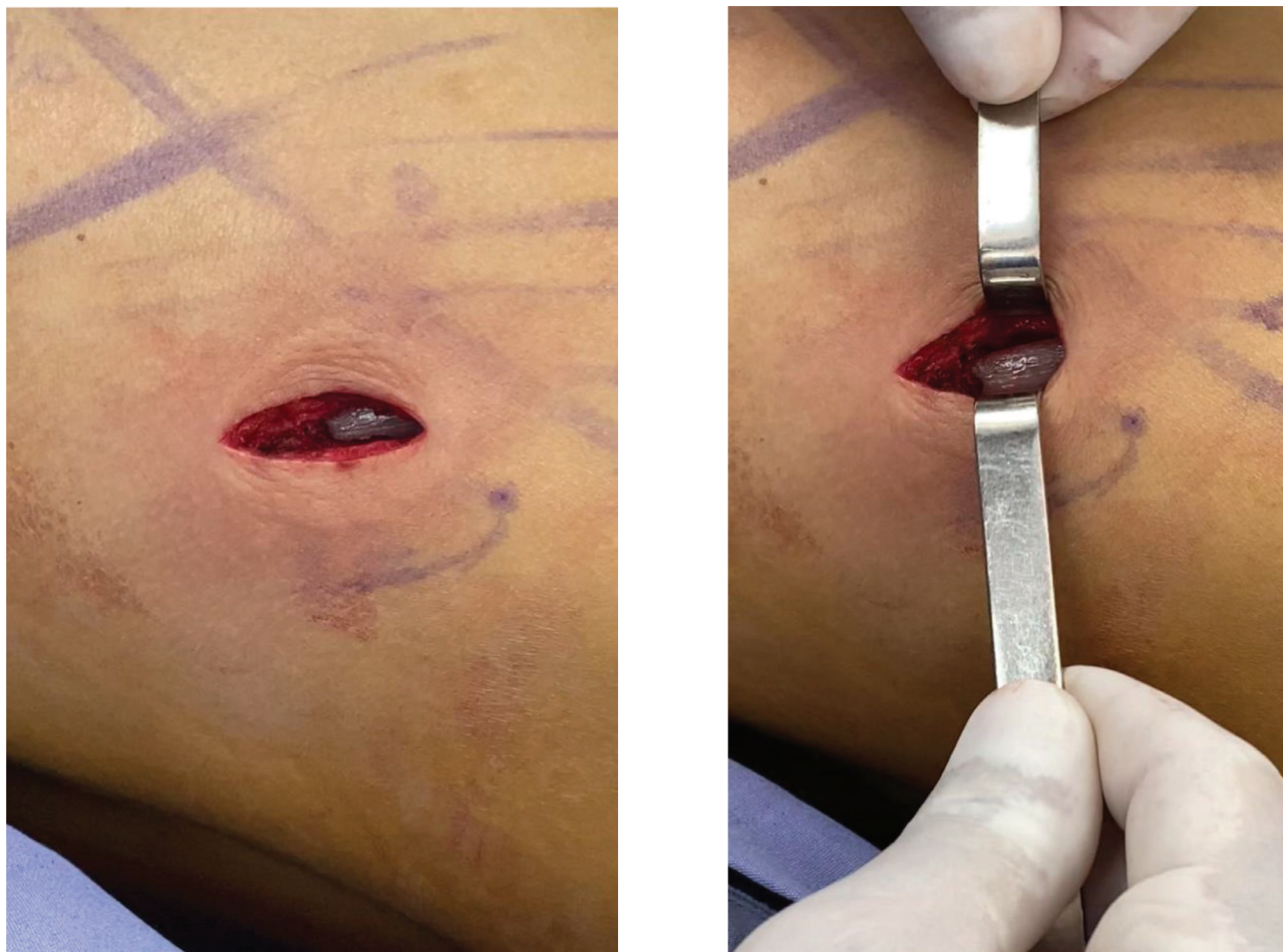


Fig. 2. (a) Eposed periosteum. (b) Visualization of the periosteum using Farabeuf retractors.

Subsequently, the posterior aspect of the rib is carefully dissected, leaving the rib bed intact and the rib perfectly separated on its posterior aspect allowing a segmental resection of 1–1.5 cm of the segment of the 10th rib. Later, it is verified that both ends, both proximal and distal, or of the 10th rib is blunt and atraumatic.

Hemostasis of the area is verified, and once the ribcage window is done, we return the approach to its original level, that is, at the level of the lower rib cage edge of the 11th rib.

To avoid injuring the pleura, the neurovascular bundle of the corresponding costal arch, and the related musculature, it is necessary to make a clean opening, surgically speaking. It is important to have precise control of the instruments in use, in order to lift the periosteum in an atraumatic manner. Also important is the separation by avulsion and not the section of the muscles and avoid to the maximum the damage of the blood vessels, which is achieved with the adequate dissection of the surgeon.

Stump bleeding from the proximal segment of rib bleeding is highly unlikely to occur in patients undergoing this technique with an incidence of less than 1%. On those few cases, bone wax is used.

As in any surgical procedure, patients are aware of the risks and have to sign an informed consent, and in case of complications attributed to it, the patient bears expenses, fees, and medications if needed.

As complete plastic surgeons, we must have precise knowledge of the anatomy and total control in surgical dexterity, just as the plastic surgeon does when lifting and taking a rib cartilage graft for nasal reconstruction, for which all plastic surgeons are trained. Therefore, I consider that by using this rib resection technique for nasal reconstruction, we are giving the possibility of producing a technique to the hands of certified plastic surgeons.

Results

A total of 104 women who underwent costal resection surgeries during a period of 8 years were identified. The average age was 29.39 at the time of surgery, being the youngest an 18 year old and the eldest a 63 year old. Only 10 of these patients underwent rib removal exclusively, being the most common combination of procedures liposuction and rib removal. Other common combinations were liposuction, abdominoplasty, and rib removal, and



Fig. 3. The distraction with gouge generates to segments, posterior, and anterior.



Fig. 4. Rib removal.

liposuction, breast implants, and rib removal. Two pneumothorax were the only transoperative complications.

Discussion and conclusion

Rib removal is a procedure widely performed as an anterior spine technique (8–11). Menard in 1894 describes the costotransversectomy as a surgical treatment for Potts disease, which consists of the exposure of the rib, along the 6 cm lateral to the costovertebral joint, allowing an anterior vertebral approach. Among the main complications of the technique are paraparesis and mild and local sensory deficits, with frequencies between 6 and 18% of the patients (8), rates higher than those reported in this case series.

As a vertebral approach technique, Hiraizumi describes an incision that follows the entire path of the 11th rib, from the paravertebral line up to 3 cm before the tip of the rib, as well as referring it as a low pleuropulmonary morbidity technique.

Subperiosteal removal of the 11th and 12th ribs is described as a nephrectomy approach technique; the main

complication of which is pleural lesion, with a risk inversely proportional to the length of the rib (5).

Nevertheless, formal literature regarding the rib removal as an aesthetic procedure is scarce.

In 2000, five transgender female patients underwent 11th and 12th rib removal surgery with the aim of narrowing the lower chest region and creating a more feminine silhouette. The authors defined this procedure as a surgery to improve body contour (6). The difference between the technique described by the authors and the technique on the present work is the size of the incision made, 40–50 mm versus 25 mm. On the other hand, while it is clear that rib removal helps the feminization of body contour in transgender female patients, the author of this article proposes the technique in cisgender women.

The purpose of this technique is giving patients a better aesthetic result by changing the anatomy of the lower region of the rib cage, causing a larger contrast between the iliac crest and the waist by accentuating and defining the waist area (Figs. 8–9).



Fig. 5. Rib removal.



Fig. 6. Rib removal.

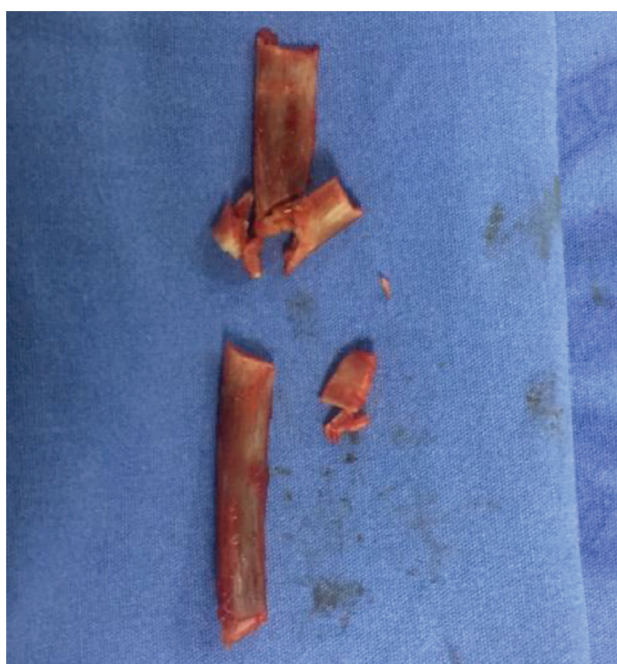


Fig. 7. The 11th rib.

We also try to avoid secondary surgeries after patients get liposculpture or abdominoplasty with results that did not meet their expectations. It is worth mentioning that this technique does not try to exaggerate waist-hip ratio but to highlight and accentuate it.

It is necessary to perform a prognosis before the surgery as it will determine the pertinence of the procedure on patients who might have an adequate waist-hip bone ratio. It is worth mentioning that this technique is reproducible but requires precise anatomical knowledge and intense training in order to carry it out avoiding complications. In Figures 8 and 9 we present a completed case with this rib removal technique where the new contour of the patients waist is reduced.

Perspectives for the future

In cosmetic surgery, there exists a vast area of opportunity in the analysis and modifications of bone structure as a determinant factor of body contour. This thought led the author to carry out the rib removal procedure.

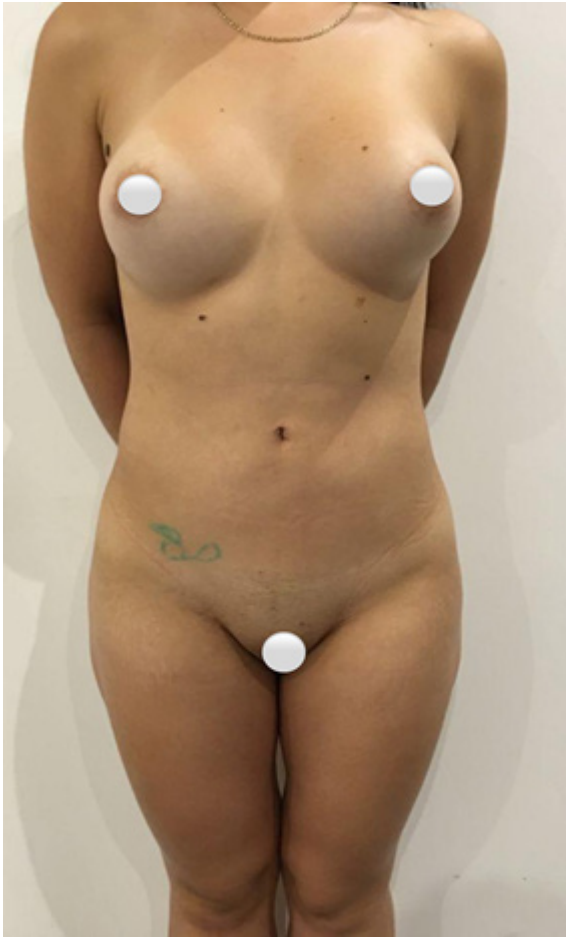


Fig. 8. Patient 32 years old prior to liposculpture and rib removal technique as described above, before surgery.

The removal of the 11th and 12th ribs allows to accentuate the waist line by increasing the space between the costal arch and the iliac crest, in patients characterized by a typically ectomomorphic silhouette, for whom traditional body contouring procedures would not have been sufficient to obtain the desired results.

Publications of this procedure in areas outside of aesthetic medicine describe a gory technique without regard to the aesthetic impact of large scars. On the other hand, there are a few formal antecedents of rib removal in aesthetic surgery, but the proportion of these compared to the background in grey literature is minimal.

The description of non-gory technique (which under the author's experience has resulted in a low complication rate) is the first step in the needed research to validate the procedure as part of the arsenal offered to patients interested in modifying their body structure beyond liposuction. It opens up an area of opportunity within the analysis of satisfaction in patients, long-term monitoring of patients, analysis of trans- and postoperative complications, as well as a quantitative and qualitative comparison with traditional body contouring procedures.



Fig. 9. Control of patient in Figure 8, 40 days after surgery.

Conflict of interest and funding

The author has no financial interest to declare in relation to the content of this article.

References

1. Lipp MB, Butterwick K, Angra K, Chunhara C, Goldman MP. Evaluation of long-term outcome and patient satisfaction results after tumescent liposuction. *Dermatol Surg* 2020; Suppl 1: S31–S37. doi: 10.1097/DSS.0000000000002498
2. Klassen AF, Cano SJ, Scott A, Johnson J, Pusic AL. Satisfaction and quality-of-life issues in body contouring surgery patients: a qualitative study. *Obes Surg* 2012; 22: 1527–34. doi: 10.1007/s11695-012-0640-1
3. Carloni R, De Runz A, Chaput B, et al. Circumferential contouring of the lower trunk: indications, operative techniques, and outcomes—a systematic review. *Aesthetic Plast Surg* 2016; 40(5): 652–68. doi: 10.1007/s00266-016-0660-7
4. Drake RL, Mitchell AMW, Vogl AW. *Gray. Anatomía para estudiantes*. 4th ed. Elsevier; 2020.
5. Watkins III, Watkins IV. *Surgical approaches to the spine*. New York, NY: Springer; 2015, pp. 96–7.
6. Davison S. Aesthetic considerations in secondary procedures for gender reassignment. *Aesthet Surg J* 2000; 20(6): 477–81. doi: 10.1067/maj.2000.111544
7. Hurwitz D. Body contouring surgery for women. In: *Comprehensive body contouring*. Berlin: Springer; 2016; 63–179. doi: 10.1007/978-3-662-46976-7_4
8. Lubelski D, Abdullah KG, Steinmetz MP, et al. Lateral extracavitary, costotransversectomy, and transthoracic thoracotomy approaches to the thoracic spine: review of techniques and complications. *J Spinal Disord Tech* 2013; 26(4): 222–32. doi: 10.1097/BSD.0b013e31823f3139

9. Bilsky MH, Boland P, Lis E, Raizer JJ, Healey JH. Single-stage posterolateral transpedicle approach for spondylectomy, epidural decompression, and circumferential fusion of spinal metastases. *Spine* 2000. doi: 10.1097/00007632-200009010-00016
10. Benzel EC. *Spine surgery: techniques, complication, avoidance, and management*. Philadelphia, PA: Gulf Professional Publishing; 2005.
11. Wang JC, Boland P, Mitra N, et al. Single-stage posterolateral transpedicular approach for resection of epidural metastatic

spine tumors involving the vertebral body with circumferential reconstruction: results in 140 patients. Invited submission from the Joint Section Meeting on Disorders of the Spine and Peripheral Nerves, March 2004. *J Neurosurg Spine* 2004; 1: 287–98. doi: 10.3171/spi.2004.1.3.0287

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Appendix A

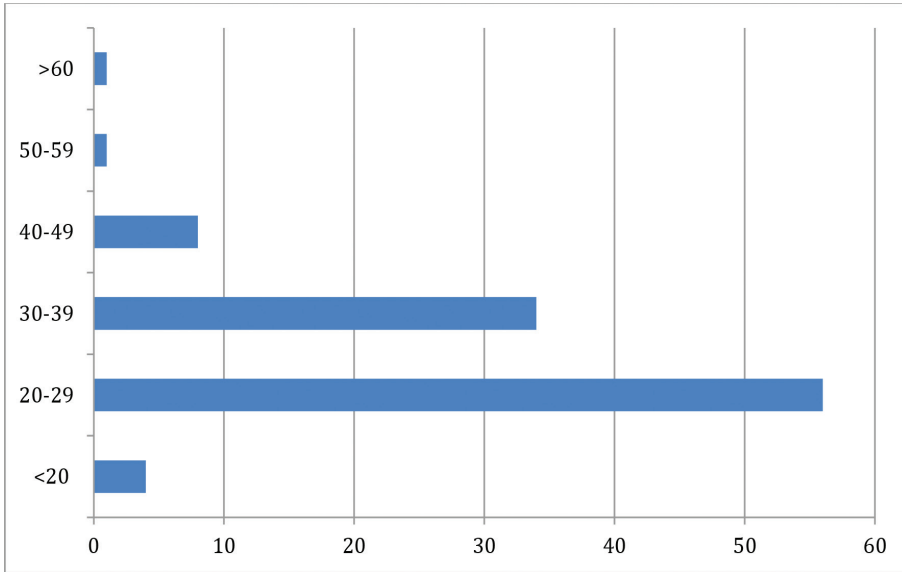


Fig. 1a. Frequency by age group.

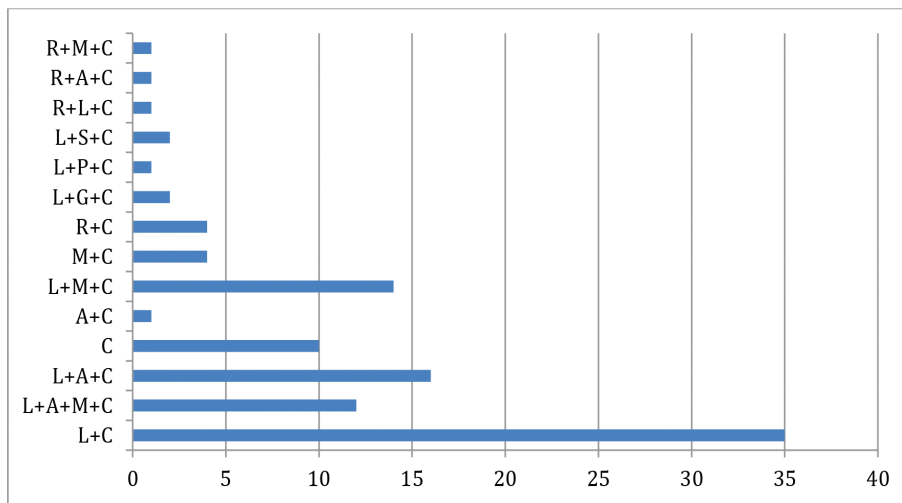


Fig. 1b. Surgery performed.

R, rhinoplasty; M, breast implants; C, rib removal; A, tummy tuck; L, liposuction; S, scar revision; G, gluteal implants.