

Research Article

Conventional and Laser-assisted Liposuction: A Case-Control Study in Lipedema Patients

Denis Souto Valente^{1*}, Rafaela Koehler Zanella², Georgia Marques Jardim³, Carolina Guimarães Herzog³, Gustavo Giancesini³ and Lauro Aita Carvalho³

¹Professor of Plastic Surgery, Surgical Clinics Division, Federal University of Medical Sciences of Porto Alegre, Brazil.

²Graduate Program in Medicine and Health Sciences, School of Medicine, Pontifical University Catholic of Rio Grande do Sul, Brazil.

³School of Medicine, Federal University of Medical Sciences of Porto Alegre, Brazil.

Corresponding Author: Denis Souto Valente, Professor of Plastic Surgery, Surgical Clinics Division, Federal University of Medical Sciences of Porto Alegre, Brazil.

Received: 📅 2024 Aug 06

Accepted: 📅 2024 Aug 26

Published: 📅 2024 Sep 16

Abstract

Background: Lipedema is a chronic condition characterized by the abnormal accumulation of subcutaneous fat, primarily in the lower extremities. Liposuction, including conventional and laser-assisted techniques, is a common symptom relief and cosmetic improvement treatment. This study compares the outcomes of conventional liposuction versus laser-assisted liposuction in patients with lipedema.

Methods: A retrospective case-control study was conducted involving 10 patients diagnosed with Grade 1 lipedema who underwent liposuction between January 2023 to April 2024. Five patients underwent conventional liposuction (control group), and five patients received laser-assisted liposuction (case group). Patient demographics, clinical characteristics, intraoperative data, and postoperative outcomes were collected and analyzed.

The laser-assisted liposuction group showed a significant reduction in operative time (94 ± 10 min vs. 122 ± 15 min, $p = 0.003$) and blood loss (408 ± 30 mL vs. 551 ± 50 mL, $p < 0.001$). Postoperative pain scores were lower (VAS: 4.2 ± 0.8 vs. 6.5 ± 1.0 , $p = 0.01$), and return to normal activities was faster (6.4 ± 1.5 days vs. 9.8 ± 2.1 days, $p = 0.03$). Complication rates were similar, with no significant differences.

Conclusion: Laser-assisted liposuction offers advantages over conventional liposuction, including reduced operative time, blood loss, and postoperative pain, facilitating quicker recovery in lipedema patients. Both methods are effective for symptom management.

Keywords: Lipedema, Conventional Liposuction, Laser Liposuction, Case-Control Study And Postoperative Outcomes.

1. Introduction

Lipedema is a chronic and progressive disorder characterized by abnormal subcutaneous fat deposition, predominantly affecting the lower extremities [1]. This condition often leads to pain, swelling, and mobility issues, significantly impacting the quality of life. While conservative treatments such as compression therapy and physical exercise are beneficial, liposuction remains the mainstay for long-term symptom relief and cosmetic improvement [2].

Conventional liposuction uses a suction cannula to remove fat, and laser-assisted liposuction employs laser energy to

liquefy fat before removal, are two widely used techniques [3]. This study aims to compare the clinical outcomes of these two methods in patients with lipedema.

2. Methods

2.1 Study Design and Participants

A prospective case-control study was conducted involving 10 patients diagnosed with Grade 1 lipedema who underwent liposuction between January 2023 and April 2024 at a single institution. The study was approved by the institutional review board, and informed consent was obtained from all participants.

2.2 Grouping

Patients Were Divided into two Groups

- Control group (n=5) who underwent conventional liposuction.
- Case group (n=5) who received laser-assisted liposuction using Lipo One Step HD device (DMC Group, São Paulo, Brazil).

2.3 Data Collection

Patient demographics (age and body mass index), clinical characteristics, intraoperative data, and postoperative outcomes were collected from medical records.

2.4 Intraoperative Data

Intraoperative data included operative time (measured in minutes) and blood loss (measured in milliliters).

2.5 Postoperative Outcomes

Postoperative outcomes were assessed using a visual analog scale (VAS) for pain and the time to return to normal activities (measured in days). Complication rates, including infection rates and the need for revision surgeries, were recorded. Quality of life was measured using the 36-Item Short Form Survey (SF-36).

2.6 Statistical Analysis

Data were analyzed using independent t-tests to compare means between the two groups for continuous variables (age, BMI, operative time, blood loss, VAS pain scores, time to return to normal activities, and SF-36 scores). Fisher's exact test was used to compare categorical variables (complication rates, including infection rates and the need for revision surgeries). All statistical analyses were conducted using statistical software (SPSS v.22, IBM, New York, USA), with a p-value of less than 0.05 considered statistically significant.

3. Results

The mean age was 42.4 ± 6.8 years in the control group and 41.2 ± 7.1 years in the case group ($p = 0.81$). The mean body mass index (BMI) was 26.3 ± 3.2 kg/m² in the control group and 27.7 ± 3.5 kg/m² in the case group ($p = 0.76$). The mean operative time for the control group was 122 ± 15 minutes, compared to 94 ± 10 minutes for the case group, demonstrating a significant reduction in the laser-assisted liposuction group ($p = 0.003$). Mean blood loss was 551 ± 50 mL in the control group versus 408 ± 30 mL in the case group ($p < 0.001$).

Postoperative pain was assessed using a visual analog scale (VAS). The control group reported a mean VAS score of 6.1 ± 1.0 , whereas the case group reported a significantly lower mean score of 4.3 ± 0.8 ($p = 0.01$). The mean time to return to normal activities was 9.8 ± 2.2 days for the control group and 6.4 ± 1.4 days for the case group ($p = 0.03$). Both groups reported significant improvements in their quality of life postoperatively, measured by the 36-Item Short Form Survey (SF-36). The control group showed an average improvement of 20.5 ± 3.2 points, while the case group showed an improvement of 22.7 ± 2.8 points ($p = 0.18$). No significant

differences in complication rates, such as infection or need for revision surgery, were observed between the two groups.

4. Discussion

Our study demonstrates that laser-assisted liposuction offers significant advantages over conventional liposuction in the management of Grade 1 lipedema, including reduced operative time, decreased blood loss, lower postoperative pain, and faster return to normal activities. These findings are consistent with previous research indicating the benefits of laser technology in enhancing surgical precision and reducing tissue trauma [4]. The significant reduction in operative time observed in the laser-assisted liposuction group compared to the conventional group highlights the efficiency of the laser technique. This finding aligns with studies suggesting that laser-assisted liposuction can streamline the fat-removal process, thus reducing overall surgical duration [5]. Blood loss is a critical factor in liposuction procedures, with excessive loss potentially leading to complications. Our study found that laser-assisted liposuction significantly reduced blood loss compared to conventional liposuction (350 ± 50 mL, $p < 0.001$).

This reduction is attributed to the coagulative effects of laser energy, which helps seal blood vessels during the procedure [6]. Postoperative pain is a common concern for patients undergoing liposuction. The lower postoperative pain scores in the laser group (VAS: 4.2 ± 0.8) compared to the conventional group (VAS: 6.5 ± 1.0 , $p = 0.01$) suggest that laser-assisted techniques may be less traumatic to surrounding tissues. This is supported by literature indicating that the thermal effects of lasers can minimize nerve irritation and inflammation [7].

The faster return to normal activities observed in the laser group is a significant advantage for patient recovery. Early mobilization is crucial for reducing the risk of postoperative complications such as deep vein thrombosis. These findings are in line with other studies that have reported quicker recovery times with laser-assisted liposuction [8].

Complication rates, including infection rates and the need for revision surgeries, were similar between the two groups. This indicates that both conventional and laser-assisted liposuction are safe procedures when performed by experienced surgeons. The similarity in complication rates is consistent with other studies comparing these two techniques [9]. Both groups reported significant improvements in quality of life, as measured by the 36-Item Short Form Survey (SF-36). The improvement was slightly higher in the laser group, although not statistically significant. This suggests that both methods are effective in managing lipedema symptoms and enhancing patient well-being, which corroborates findings from other research in this field [10]. Our study's findings emphasize the clinical benefits of laser-assisted liposuction in reducing intraoperative and postoperative morbidity. However, it is essential to consider that the cost and availability of laser technology might limit its widespread adoption. Future studies should evaluate the

cost-effectiveness of laser-assisted liposuction to provide a more comprehensive assessment.

Despite the promising results, our study has several limitations. The small sample size (n=10) may limit the generalizability of our findings. A larger, multicenter study would provide more robust data and help validate our results. Additionally, the retrospective nature of the study may introduce selection bias, and prospective randomized controlled trials are needed to confirm these findings. Furthermore, our study did not evaluate long-term outcomes beyond the immediate postoperative period. Long-term follow-up is essential to assess the durability of symptom relief and any potential delayed complications. Future research should focus on the long-term efficacy and safety of laser-assisted liposuction in lipedema patients. In conclusion, laser-assisted liposuction offers significant advantages over conventional liposuction in patients with lipedema, including reduced operative time, decreased blood loss, lower postoperative pain, and a faster return to normal activities. Both methods effectively manage the symptoms of lipedema, with similar safety profiles and improvements in quality of life.

Declaration of interest, Funding and Acknowledgements

Declaration of interest

No conflict of interest could be perceived as prejudicing the impartiality of the research reported.

Funding

This research did not receive any specific grant from any funding agency in the public, commercial or not-for-profit sector.

References

1. Rockson, S. G. (2024). Focus on Lipedema: Unraveling the Mysteries Through Research. *Lymphatic Research and Biology*, 22(2), 91-92.
2. Bejar-Chapa, M., Rossi, N., King, N., Hussey, M. R., Winograd, J. M., et. al. (2024). Liposuction as a Treatment for Lipedema: A Scoping Review. *Plastic and Reconstructive Surgery-Global Open*, 12(7), e5952.
3. Jeong, J. H., Park, C. (2024). Comparative Study of 1444 nm Laser Monotherapy versus Integrated Liposuction in the Treatment of Axillary Osmidrosis. *Medicina*, 60(7), 1151.
4. Faustino, L. D., Cruciol, F. S., Motoki, T. H., Figueiredo, I. A., Garcia, A. F., et. al. (2023). Treatment and Prevention of Umbilical Sagging with Laser-assisted Liposuction: The New Happy Protocol. *Plastic and Reconstructive Surgery-Global Open*, 11(6), e5022.
5. Brañas, E. B., Moraga, J. M. (2013). Laser lipolysis using a 924-and 975-nm laser diode in the lower extremities. *Aesthetic plastic surgery*, 37, 246-253.
6. Chia, C. T., Albert, M. G., Del Vecchio, S., Theodorou, S. J. (2018). 1000 consecutive cases of laser-assisted liposuction utilizing the 1440 nm wavelength Nd: YAG laser: assessing the safety and efficacy. *Aesthetic Plastic Surgery*, 42, 9-12.
7. Pereira-Netto, D., Montano-Pedroso, J. C., Aidar, A. L. E. S., Marson, W. L., Ferreira, L. M. (2018). Laser-assisted liposuction (LAL) versus traditional liposuction: systematic review. *Aesthetic Plastic Surgery*, 42, 376-383.
8. Piccolo, D., Mutlag, M. H., Fusco, I., Bonan, P. (2023). Facial and body contouring with 1444 nm Nd: YAG laser-assisted lipolysis: Clinical evidence. *Skin Research and Technology*, 29(7), e13400.
9. Collins, P. S., Moyer, K. E. (2018). Evidence-based practice in liposuction. *Annals of plastic surgery*, 80(6S), S403-S405.
10. Valente, D. S., Padoin, A. V., Carvalho, L. A., de Azambuja Pereira Filho, G., Ribeiro, V. W., et. al. (2016). Prospective and bidirectional cross-sectional associations between body mass index and physical activity following liposuction: A cohort study. *Plastic and Reconstructive Surgery*, 138(1), 48e-54e.