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Review Article

Limberg flap: a review

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ABSTRACT

Alexander Alexandrovich Limberg, Surgeon and Dentist, greatly contributed to the modern practice of plastic surgery. He defined the rhomboid flap (Limberg flap). The simplicity and effectiveness of the Limberg flap make it versatile, allowing adequate aesthetics with few complications. The split is made up of two equilateral triangles with angles of 60° and 120°, respectively. An adequate knowledge of the mechanisms of rotation and sliding of skin tissues is essential to indicate the use of this type of flap and to perform it. The skin can be moved from adjacent sites and must be mobile enough to close the defect with minimal tension. The Limberg flap is a flap that takes advantage of the laxity of the skin adjacent to the defect to allow the transposition of tissue with similar characteristics to the excised tissue.

Keywords: Limberg flap, Flap, Rhomboid flap, Skin defect

INTRODUCTION

Alexander Alexandrovich Limberg, graduated from the Military Medical Academy in 1919, in 1924 he became head of the subdepartment of stomatology at the Second Leningrad Medical Institute and of the maxillofacial department at the Leningrad Institute of Traumatology and Orthopedics. Simultaneously, in 1935, he organized and became chief of the subdepartment of maxillofacial surgery at the Leningrad Institute for the Advanced Training of Physicians, head of the subdepartment of surgical stomatology at the Leningrad Stomatological Institute (1946–56), and professor of maxillofacial surgery and stomatology at the Leningrad Pediatrics Institute (1943–45).[1] Limberg was a prominent surgeon who contributed greatly to the modern practice of plastic surgery, he defined the rhomboid flap (Limberg flap), due to the simplicity and effectiveness of the Limberg flap it makes it versatile, allowing adequate aesthetics with few complications. The split is made up of two equilateral triangles with angles of 60° and 120°, respectively. The placement of the Limberg flap greatly influences its survival and cosmetic appearance, it should be placed in the direction of minimum tension and maximum extensibility. The flexibility of the skin in the area to be excised can be inspected by pinching the skin with the forefinger and thumb. Flap placement becomes more challenging on the face, where anatomical features as well as the availability of adjacent tissue can create limits when using the Limberg flap. The incisions should not be placed over the lines of tension of the relaxed skin; instead, the incisions should be made parallel to the lines of tension of the relaxed skin. Placing incisions parallel to Langer's lines allows the resulting scar to fall within the skin folds. A reduction in tension on the flap decreases the likelihood of donor tissue necrosis. Parallelogram-shaped defects are ideal for the use of a Limberg flap.[2] This Limberg flap contains skin and subcutaneous tissue transported from a donor area to a recipient area, thus maintaining a vascular

connection with the site of origin.[3] So, it has a wide use in the field of plastic surgery, both for the repair of facial defects, whether in the eyelids, cheeks, nose and lips, as well as for the treatment of sacrococcygeal pilonidal disease, among others, and achieve the maintenance of the function and aesthetics of the region.[4-7] These are transposition flaps, that is, they combine the movement of rotation with advancement by turning on the center of the base of its pedicle. Its irrigation follows a random pattern (random) and derives from the subdermal plexuses.[3,8]

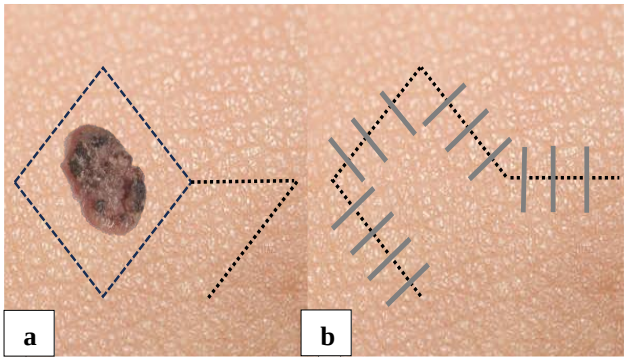

Figure 1: (a) Planning of the Limberg flap, and (b) completion with flap rotation movements.

CLASSIC LIMBERG FLAP

This type of flap must be planned before removing the defect, since it requires exact geometric measurements. Allows tissue to be transposed from four possible different areas. The Limberg flap design consists of a mirror image of the defect, which is in the shape of a diamond (angles of 60° and 120°, which are equal to their opposite angles, with all sides equal). Since the shape of the rhombus consists of the union of 2 equilateral triangles, the design of the Limberg flap consists of the extension of an imaginary line that divides the rhombus of the defect into these 2 triangles, which must be equal to the sides of the rhombus. Variation from classic straight designs to curved lines allows better support to tensile forces.[9] An adequate knowledge of the mechanisms of rotation and sliding of skin tissues is essential to indicate the use of this type of flap and to perform it. The skin can be moved from adjacent sites and must be mobile enough to close the defect with minimal tension.[8] Therefore, the importance of always carrying out good planning in the design and handling of the flaps used to avoid the loss of a tissue resource, always limited, is highlighted.[10] Rhombic flaps are locally transposed geometric flaps and offer great versatility within reconstructive surgery. This flap is most commonly used to fill skin cancer defects in the head and neck region. While successful results have been reported in a variety of anatomical locations and pathologic defects, such as spina bifida, burn contractures, chronic pilonidal sinuses, hand and breast reconstruction. There are multiple modifications such as the Duformental and Webster to the Limberg rhomboid flap that consist in making the angles of rotation smaller in order to have less excess tissue.[11] The use of the Limberg flap may be planned especially for a skin defect that may be secondary to trauma, a chronic wound, certain types of cancer, a non-healing wound, infection, scar formation, or removal of a scar. skin lesion, however it is important to ensure that the patient's general health status is optimal, especially nutritional parameters and glucose control, ideally without smoking. In some cases, the skin edges should be debrided if necessary to achieve good vascularization. The application of this flap has been described in almost all parts of the body with extreme safety and good cosmetic results.

CONTRAINDICATIONS

Although the rhomboid flap has been found to be very versatile, there are cases in which a different flap design should be considered. The main limitation is in patients with a lower body mass index and less available skin. This is based mainly in the relative lack of tissue adjacent to the skin defects. For example, for relatively larger nasal defects, a flap design may be preferable bilobed. To reconstruct very large defects, the margins of the default to reduce the overall size.

Additionally, multiple smaller rhomboid flaps can be considered. There are also other options such as the trapezoidal flap. However, the large size of the defect is a relative contraindication, as the authors have published case reports in the literature in which defects were successfully reconstructed trunk very large with a rhomboid flap design. Patient factors, such as nicotine exposure and poorly controlled diabetes, are also relative contraindications.[12-14]

CONCLUSION

The Limberg flap takes advantage of the laxity of the skin adjacent to the defect to allow the transposition of tissue with similar characteristics to the excised tissue. This may allow for superior esthetics compared to skin graft reconstruction, making it essential for any surgical training.

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REFERENCES

1. The Free Dictionary. "Limberg, Aleksandr". The Great Soviet Encyclopedia, 3rd Edition. The Gale Group, Inc 1970-1979. Available at: https://encyclopedia2.thefreedictionary.com/Limberg%2c+Aleksandr. Accessed on 12 March 2023.
2. Anchundia García F, López Rosel A, Guaya Iriarte A, Taipe Topón D. Versatility of the Limberg flap in the closure of skin defects. J American Health. 2021;4(2):95-109.
3. Suárez Fernández R, Valdivieso M, Martínez D, Mauleón C, Lázaro Ochai- ta P. Colgajos cutáneos: los más usados. Rev Derm Madrid. 2001;4(5).

4. Jovanovic M, Colic M. Design of the Limberg Flap by a Specially Designed Ruler: A personal Approach. J Am Soc Plastic Surgeons. 2004;113(2):653-8.
5. Bazzano C. Colgajo romboidal de Limberg: una solución quirúrgica en la reconstrucción de punta de nariz. Act Terap Dermatol. 2008;31:48.
6. Calderón W, Bonacic S, Calderón D, Paillalef A, Elgueta R. Useful flaps in General Surgery. Chil J Surg. 2010;62(6):649-52.
7. Medina Murillo G, Rodríguez Medina U, Rodríguez Wong U. Limberg flap: its usefulness in cosmetic dermatology. Rev Hosp Jua Mex. 2015;82(2):118-21.
8. Ernesto A. Moretti, Jonathan Camargo, Julieta Settecasi, Darío Alarcón, David Chanchi. Limberg´s flaps: variants and applications. Revista Argentina De Cirugía Plástica. 2017;23(1):21-6.
9. Imafuku K, Hata H, Yamaguchi Y, Inamura Y, Kitamura S, Yanagi T, Shimizu H. Modified Dufourmentel flap, easy to design and tailor to the defect. J Dermatol. 2017;44(1):68-70.
10. Iribarren O. Reconstrucción de cuero cabelludo. Cuad Cir. 2000;14:80-9.
11. Patel K, Sykes J. Concepts in local flaps design and classification. Operative techniques in Otolaryngology. Elsevier. 2011;22:13-23.
12. Aydin O, Tan O, Algan S, Kuduban S. Versatile use of rhomboid flaps for closure of skin defects. Eurasian J Med. 2011;43(1):1-8.
13. Hon H, Chandra S. Rhomboid Flap. Atlas Oral Maxillofac Surg Clin North Am. 2020;28(1):17-22.
14. Kang A, Kang K. Rhomboid flap: Indications, applications, techniques and results. A comprehensive review. Ann Med Surg (Lond). 2021;68:102544.

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