



Abbe Flap for Upper Lip Reconstruction

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Introduction: Lips are complex structures that are part of the facial esthetics. Their integrity may be affected by congenital diseases, trauma, burns, and cancers, among other pathologies. The reconstruction of the upper lip subunit can be a challenge for the surgeon. The purpose of this paper is to review the Abbe flap technique with the help of tips from the primary surgeon (surgical tips) and present a series of cases as experience in upper lip reconstruction.

Methods: A retrospective study at Chilean centers Fundación Gantz and Clínica Alemana de Santiago from 2003 to 2023. The surgical technique was described, and different variables were assessed. The Strasser scale was used as an objective method for assessing the results.

Results: Sixteen surgery patients, 50% female and 50% male. Fourteen patients (87.5%) with cleft lip and palate. In total, 85.71% of the total number of patients with follow-up had a good score of 1 to 4 on the Strasser scale. There were no mediocre results comparable to results described in other series. There were no complications relating to the technique.

Conclusions: The Abbe flap technique continues to be an excellent option in upper lip reconstruction, especially in patients with a condition of the middle third of the lip. Knowledge of the anatomy, the surgical technique, the function of the lip, and facial esthetics leads to acceptable results for the patient and their environment with this technique.

Key Words: Abbe flap, esthetic subunit of the upper lip, cleft lip, lip reconstruction, Strasser score, upper lip

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Lips are complex functional structures that are part of the facial esthetics. They occupy the lower third of the face and play an essential role in facial expression, mastication, speech, and the individual's identity. Symmetry and harmony are considered attractive in facial esthetics.^{1,2}

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The upper lip is divided into 3 different aesthetic subunits: the philtrum and one lateral subunit on each side.³ It is located in the middle third of the face and comprises the region defined by the base of the nose and the 2 nasolabial folds on each side. It includes both the white upper lip and the pink lip or vermilion. The Cupid's bow is formed by 2 paramedian elevations. The philtrum is in the center, delimited by 2 elevated vertical columns on each side of the middle line inside the white upper lip.^{1,4–6}

Various pathologies such as cancers, trauma, burns, malformations, sequelae of systemic diseases, etc. are capable of seriously affecting the anatomy of this subunit and generating a defect in the lip. For this reason, functional reconstruction with aesthetic restoration of lip defects presents a significant challenge for the reconstructive surgeon.^{7,8}

The reconstruction of the lip involves various techniques. There are several options for the reconstruction of the defect,^{6,9–12} and this will vary according to the patient. Understanding the lip anatomy and its close relationship with the function and esthetics of the upper lip in a comprehensive manner is fundamental.³ Achieving a successful outcome demands careful attention in the design and execution of the technique.¹³ The main reconstructive options include closure by secondary intention, skin grafting, primary closure, local flaps and free flaps. When considering the reconstruction of the lip defect, the reconstruction staircase starts with the simplest procedures and then moves on to the most complex. Possible reconstructions for the upper lip include primary closure, advancement flaps, tissue transposition flaps, nasolabial flaps, V-Y advancement, Abbe, Karapandzic, Estlander, and Bernard-Burow flaps, among others, with their variants and different combinations depending on the defect's needs.^{3,7,10–17}

Cleft lip, isolated or associated with cleft palate, and isolated cleft palate are the most relevant congenital defects in the facial region. Cleft lip occurs in 1 out of 1000 live births and is most frequent in males. In 80% of cases, it is unilateral, and in 20%, bilateral. Cleft lip may partially or fully compromise the lip. Cases may range from mild (congenital scar or forme fruste lip) to complete clefts affecting the lip's red to the floor of the nose and completely disrupting the orbicularis muscle. There might also be compromise of the gum and the maxilla's alveolar ridge (primary palate).^{18,19} In clinical practice, repairing secondary defects resulting from cleft lip, particularly bilateral, is frequent and a real challenge for plastic surgeons.²⁰

Cross-lip transfer of full-thickness tissue was first described by Sabattini (1838), and later by Abbe in 1898.^{21,22} In 1837, Italian surgeon Pietro Sabattini was the first to describe the flap for lip reconstruction as a result of a traumatic injury of the upper lip.²² This technique was subsequently modified in 1898 by Robert Abbe, an American surgeon who used this surgical procedure to repair a bilateral cleft lip. Abbe's work was the first to be published in English. As a result, the flap still bears his name today.^{16,23}

It is designed as a rotational or lip switch flap from the opposite lip based on the labial artery, which is preserved on one side to serve as a pedicle of the interpolated flap. There are

no associated veins, and venous drainage is provided by small veins that run parallel to the course of the artery.^{5,9,10,15}

The surgical outcome can be analyzed both subjectively and objectively. Various methods have been used for its assessment, including direct facial assessment tools, two-dimensional photographs, tridimensional digital imaging, or a combination of these methods and their analysis with software and digital assessment systems.^{17,24}

The purpose of this paper is to review the technique with the help of tips from the surgeon (surgical tips), present our experience with the Abbe flap in reconstructing the anatomical subunit of the upper lip, and assess the results using the Strasser technique.

METHODS

A retrospective analysis was conducted of patients operated at Fundación Gantz and Clínica Alemana de Santiago, both centers in Santiago, Chile, with upper lip defects or deformities on whom an Abbe flap was performed as a surgical technique for reconstruction. A series of 16 patients between 2003 and 2023 was identified. The following variables were reviewed: age at the time of surgery, sex, diagnosis, simultaneous supplementary surgical procedures, surgery results, follow-up, and complications. A description of the technique used in the presented cases was made. In patients with photographic follow-up, an objective assessment for the analysis of the aesthetic results obtained after the reconstruction was conducted by 4 plastic surgeons external to the medical team (blind to the study), and an assessment of postoperative photographs of all patients was made using the Strasser scale, categorizing the results as excellent (0 score), good (1–4 score), mediocre (5–14 score), and bad (score higher than 15). This included lip distortion, incorrect position of the philtrum, columellae, white lip lines, asymmetry in the lip subunit or with neighboring subunits, deformation of the upper lip, Cupid bow, and remaining scar: hypertrophy, tension, retraction. These results were included in tables for their presentation, analysis, and discussion (Supplemental Table 1, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971> and 2, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971>).

The inclusion criteria were patients with an upper lip defect feasible to be improved by reconstruction with an Abbe flap. The surgical indication was loss of the normal anatomy of the upper lip tissue due to a condition of 1 or more subunits of the upper lip: asymmetry, irregular, or hypertrophic scar, tension, and retraction characterized by shortness of the upper lip tissue, absence of the Cupid bow or mucocutaneous line in the middle third, absence or severe distortion of the philtrum. As a main indication, we took patients in which the reconstruction of the upper lip defect with local tissues is not possible. A defect compromising both lips or the nonfeasibility of using the bottom lip or labial artery as a pedicle for the reconstruction was established as an exclusion criterion.

Surgical Technique

In all cases, the surgical technique was performed by a single surgeon (first author) using general anesthesia with nasotracheal intubation as a preference to avoid distortion. Orotracheal intubation was performed in patients with simultaneous procedures. Marking of the anatomical repair points, the areas requiring resection and the design of the pedicle was performed with patent green. 2% lidocaine solution with epinephrine 1:50,000 was infiltrated.

It is essential to stress the importance of making sure that the patient has a proper understanding of the procedure. The parents or caregivers of underage patients or with special requirements must understand the technique's explanation. Special emphasis must be placed on the fact that it is a pedicle flap that needs to be performed in 2 surgical stages, separated by a period of 21 days in which there will be special care indications.

The surgery begins with the flap's design, preferably with the patient awake and not intubated to prevent deformities (Fig. 1). It is important to previously identify and define the defect, areas subject to resection, the distortion in the philtrum, philtral crests, white lip line, Cupid bow, central tubercle in the vermilion. Define the ideal dimensions of the center of the patient's lip: global height of the lip, including philtrum height, philtral crests, dimensions of the Cupid bow and lip tubercle to size the desired projection and have a clear picture of what is intended, considering the defect and the patient. The flap must be sufficient to correct the defect. The basic Abbe design was made in the lower lip in a triangular shape with an upper base located in the middle line, with a width between 10 and 15 mm and a length sufficient to reach the columella. Special care was taken on the white line of the lips to prevent step-offs and structural asymmetries. Double-marking was made on the mucocutaneous or white line of the lower lip when cutting the flap (Fig. 1). This provided a guide for proper approximation of the lower lip on the same plane after the resection, preventing imperfections in the donor area. The ideal height of the patient's upper lip was previously defined when cutting the flap in the donor area, which helped define the flap's horizontal and vertical dimensions.

A careful dissection was made in the donor area to determine the location of the labial artery in the patient. This provided a reference regarding the depth from the lip's mucosa for the

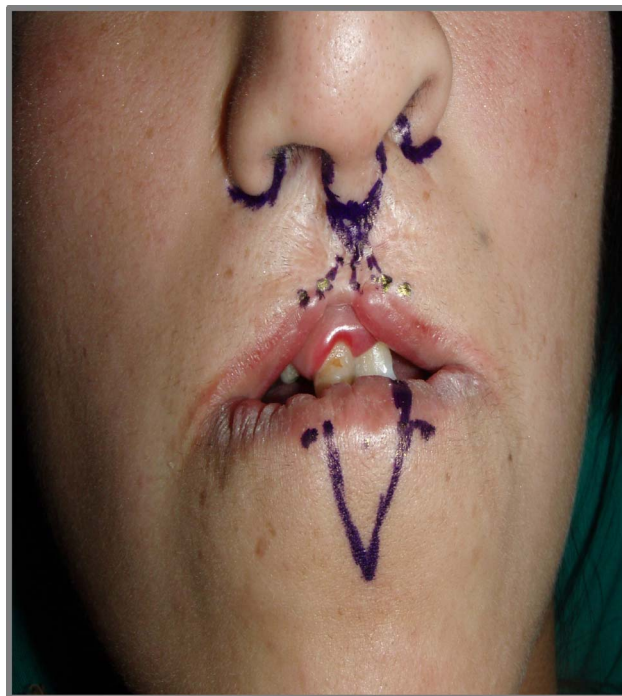


FIGURE 1. Cutting of the flap with the patient awake; special emphasis on reference points that will guide the incision, resection, and closure, reducing unwanted defects.

dissection on the pedicle's side. A ridge of tissue was left without dissecting the artery, preventing the flap's loss of irrigation. The orientation of the pedicle was chosen to the left or right according to the local conditions in the lower lip (Fig. 2).

The initial reference points on the lip's mucocutaneous line were used in both segments of the flap. The closure by planes was performed from medial to lateral in three planes, starting with the mucosa of the new vestibule and continuing with the orbicularis muscle of the lips with polyglactin 910, ethilon skin 6-0.

In some cases, it was necessary to perform supplementary surgical techniques such as rhinoseptoplasty, or even other flaps or local techniques such as Burow triangles, etc.

All of our patients received a soft liquid diet with a straw during the first days, avoiding extreme chewing movements. They remained in partial rest during this period, with good nontraumatic oral cleaning (Fig. 3). They were evaluated weekly through personal visits.

Second Stage: Sectioning of the Pedicle, Separation of the Lips

All patients were operated again 3 weeks later (21 d), as irrigation to the new segments is considered to be independent during this time. The separation of the flap and the ligation of the labial artery were performed, with the closure of both segments in a now independent manner, completing the reconstructive phase. Stitches are removed after 7 to 10 days. Observation of the healing process is 6 to 8 months, with rehabilitation of the wound with massages and use of compressive fabrics on the scar.

There were a total of 16 patients (100%) (Supplemental Table 1, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971>) on whom an Abbe flap was performed for the reconstruction of upper lip defects, with ages between 13 and 30 (average age of 19). Eight patients (50%) were female, and 8 patients (50%) were male. Of the 16 presented patients, 14 (87.5%) experienced sequela of bilateral cleft lip and palate,

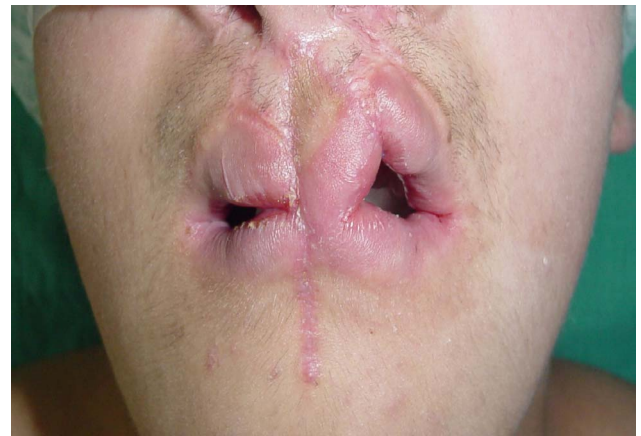


FIGURE 3. Engraftment phase: In this phase, the lips are fused and the tissue has proper irrigation. It remains this way for 3 weeks.

from which one patient additionally had an associated diagnosis of frontonasal dysplasia. Only 1 patient (6.25%) had unilateral cleft lip and palate. In one of the patients (6.25%), the defect was a loss of upper lip due to necrosis secondary to candida mycosis in the context of a complication from leukemia under treatment with chemotherapy. Twenty-five percent of the patients underwent simultaneous procedures, which were rhinoplasties in all cases. A lateral cheek advancement flap was added in the complex case of upper lip reconstruction on the patient diagnosed with leukemia and a candida condition.

In 14 patients (87.5%), there was long-term follow-up (Supplemental Table 1, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971>) with assessments using the Strasser method (Supplemental Table 2, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971>, Fig. 4) conducted by the 4 evaluators. Upon averaging the values, they considered that 14.29% of the cases had excellent results and 85.71% were within the "good" score. There were no cases with mediocre or bad scores, as shown in the Supplemental Table, Supplemental Digital Content 1, <http://links.lww.com/SCS/G971>.

None of the patients had serious complications. Two of them (12.5%) exhibited mild hypertrophy of the scar. There was no partial or total loss of flaps or other complications associated with the surgical technique.

DISCUSSION

The Abbe technique was described over 120 years ago and has been replicated and modified on multiple occasions by surgeons all around the world.^{1,8,10,16,17,20,21,24-31} Upon searching the literature, ~197 articles appear on PubMed, most of them case series. No meta-analyses or prospective studies unifying criteria for the technique are found, particularly in Latin America. The



FIGURE 2. Surgical technique: elevation, rotation, and closure. A margin of tissue to the artery was left when elevating the flap; there was no skeletonization. Only a 180-degree rotation was made to avoid kinking the pedicle. The tissue was handled gently. Closure in 3 planes.



FIGURE 4. Strasser score, before and after in 4 of our patients.

Scandinavian Journal of Plastic and Reconstructive Surgery features an article by Wulf-G and collaborators published in 1974 with 204 cases,³² most of them patients with a diagnosed cleft lip and palate (62.9%), including the primary technique. In our series, the correction group in patients with defects secondary to cleft lip and palate procedures accounts for 87.5%. Neoplastic lesions, trauma, and other lesions represent a smaller percentage. In our experience with 1 patient (6.25%), the defect was a loss of the upper lip due to necrosis secondary to candida mycosis in the context of a complication from leukemia under treatment.

The literature is varied when referring to the technique. There are case studies, such as the one by Bagatin and collaborators in Croatia,²⁶ that are perfectly comparable to our series in proportion, technique, and results. However, there are also many series and cases, such as those by Navarro and collaborators in Peru¹⁷ with 44 patients, yet featuring a modification in the subcutaneous Fleur de Lys technique that does not allow for a comparison of results, as is the case of many other published series. Others like Steinberg et al¹⁶ include cases that use the Abbe flap technique only in the primary repair of patients with a congenital cleft, which prevents us from comparing them with our case study, in which, for all patients with unilateral or bilateral cleft lip and palate (93.75%), another technique was performed for the primary repair and the Abbe flap was used as a repair technique for secondary defects in the middle third of the upper lip. Nonetheless, upon reviewing all of these series, it is clear how versatile and reproducible this procedure is.

The technique can be applied to both sexes.³ There is no significant evidence supporting the applicability of the technique according to sex, as our series included 50% females and 50% males. As for age, the average age in our series was 19, very similar to the literature²⁶ that included cleft patients and a bit further from the series that included patients with neoplasia, which normally occurred at later ages. We found unified criteria in the reviewed literature in terms of the inclusion criteria, which considered, just like in 100% of our patients, loss of the normal anatomy of the upper lip tissue due to a condition of one or more subunits of the upper lip: asymmetry, irregular, or hypertrophic scar, tension, and retraction characterized by shortness of the upper lip tissue, absence of the Cupid bow or mucocutaneous line in the middle third, absence or severe distortion of the philtrum.^{3,10,11,13,14,16,17,21,23,26,27,31,33,34} This is undoubtedly useful for the reconstruction of the philtrum, as the incision lines on the edges of the flap can recreate the folds of the philtrum skin (philtral columellae).³ In this sense, the literature shows that the results obtained in different series are acceptable for the patients.^{1,6,11,13,15,24–29,35} As mentioned previously, multiple variations of the technique have been published in a constant search for better results.^{5,8,16,17,23,25,27,29,31,33,36–38} Consensus has not yet been reached, and the publication of results of cases and series is important to learn about the advantages and disadvantages of the technique. To optimize results, we believe it is important to consider the accurate and consistent marking of anatomical reference points and resection areas,²³ as done in our series, in which we also highlight the advantage of marking reference points in the donor area (Fig. 1); just like the artery must not be skeletonized when elevating the flap to minimize the appearance of venous congestion¹³ and flap losses. Fortunately, in our series, there were no complications related to loss or failure of the flap but complications inherent to the healing process, such as scar hypertrophy in 12.5% of patients. This is consistent with the 3% to 21% reported in the literature for lip repairs.¹ Bagatin²⁶ describes similar results in their series, with visible scars and bulges in a third of their patients. The disadvantages of the Abbe

flap include the patient's discomfort and the need for multiple procedures.¹⁴

In most of the found publications, the assessment was subjective. Regarding the objective assessment of results, we found few papers.^{24,30} In our series, the Strasser method proved useful and appropriate as an objective method for assessing results.^{39,40} Our results show a total of patients with adequate results (14.71% with results categorized as excellent, and 85.7% as good). Luckily, we had no results categorized by the blind evaluators as bad or mediocre.

Discussing Abbe cases always leads to various questions, for which we consider it ideal to individualize the cases, not generalize the technique, think about the potential benefits and be very clear on its limitations, the stress it generates for the patient (21 d without opening the mouth during the engraftment phase, weight loss due to a liquid diet in this process) and the patient's expectations (we must always guide them toward real expectations). That is why the publication of small case series and constant reviews play a very important role in the accumulation of experiences.

CONCLUSIONS

Performing an Abbe flap requires mastering and understanding the anatomy, physiology, functionality, and esthetics of the patient's lip and face, as well as their pathology. After analyzing our cases and reviewing the literature, we believe that whenever there is an upper lip defect, particularly in the middle third, we must think about applying the Abbe technique. We recommend it because it is a reproducible, reliable, and versatile technique with good aesthetic results and a low complication rate. However, a disadvantage is that it is a surgery in 2 stages with a latency period that is uncomfortable for the patient. This is compensated by reconstruction with neighboring tissue, without mutilations or elevated surgical risks, with excellent functional results and slight changes in appearance that are acceptable for the patients and their environment.

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