



PLASTIC AND RECONSTRUCTIVE SURGERY USING SUBCUTANEOUS ENDOSCOPY

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Abstract

Background: The majority of patients are discouraged from having reconstructive surgery because of the scar that it leaves behind. Subcutaneous endoscopic surgery is meant to resolve this problem; it can minimize the size and visibility of the scar as well as give better access to the performance of the surgery. This study is a case series where subcutaneous endoscopic methodology was employed to address the problems of reconstructive surgery. The single and two-port technique was used to simplify muscle harvesting in the procedure.

Methods: A 4 mm and 30-degree side viewing telescope, cold light source, sheath, and an optical camera were employed in the single port endoscopic technique. Post-operative pain, access to the incision, complications, and patient satisfaction were reviewed in the case records.

Result: In all the 201 surgeries performed endoscopically, only one of the complications was found during the procedure, which was transient nerve palsy, which was completely resolved later. One of the patients also reported post-operative pain, which was managed with minimal amounts of analgesic drugs. Intraoperative bleeding was reduced significantly compared to conventional reconstructive procedures. All the single-port endoscopic surgeries were successful, with high patient satisfaction.

Conclusion: High patient satisfaction and reduced scar visibility were reported when subcutaneous endoscopic surgeries were performed instead of conventional reconstructive surgeries.

Keywords: endoscopy, plastic and reconstructive surgery, reduced access

Introduction

Initial enthusiasm surrounding the integration of endoscopy into reconstructive surgery during the 1980s gradually transitioned to prominent utilization in cosmetic surgery over the subsequent period. This shift possibly mirrored the increasing predominance of aesthetic surgical practices during that period. This research endeavours to examine the historical encounters with subsurface endoscopy within the realm of reconstructive surgery, its procedural evolution, as well as its novel applications.

Over a span of ten years, the author has successfully employed subsurface endoscopy in a variety of recognized and previously unexplored scenarios, yielding favourable outcomes.

Notwithstanding the formidable learning curve associated with mastering the intricate techniques essential for subsurface maneuvers such as tunnelling, precise dissection, and effective hemostasis, compounded by challenges like impaired visibility due to the endoscope's tip emitting smoke and potential obscuring, as well as the intricacy of conducting distant dissections with stereoscopic vision, the constructive results validate the merits of Subcutaneous Endoscopy in Plastic and Reconstructive Surgery. This study aimed to simplify the existing approaches in subsurface endoscopy.

Methods

This retrospective analysis presents a case series encompassing 200 patients who underwent a total of 201 subcutaneous endoscopy procedures spanning a decade. The procedures were performed for various indications across diverse anatomical regions, ranging from lump removal to muscle harvesting. Age and gender were not exclusion criteria for participation.

Endoscopic techniques were either the primary approach or part of the whole surgical procedure. Comprehensive patient-specific data, preoperative clinical assessments, and imaging evaluations were collected from the case records. In the case of minors informed consent discussions were conducted with parents and guardians, comparing endoscopy to conventional methods. Surgical duration and procedural intricacies were documented. Postoperative pain within 24 hours was quantified using a Visual Analog Scale (VAS), categorized as absent (0), benign (1-4), bearable (5-8), or severe (9-10). Similarly, VAS scores for patient satisfaction were recorded during the final review, stratified as none (0), subtle (1-4), medium (5-8), or high (9-10). Patient follow-ups ranged from one month to decade. Incision to access the area were strategically positioned behind the frontotemporal hairline, intraoral area, conjunctiva, axillary region, umbilicus, areola, or adjacent skin. Incisions were of 1.0 cm to 4.0 cm, with various patterns such as hair follicle preserving, straight stab, or zigzag. Dissection occurred at subcutaneous, subfascial, subperiosteal, or subgaleal planes. Predominantly, single incisions were used.

A 4-mm endoscope with a 30-degree viewing angle, with cold light source and a 3-chip camera system (Karl Storz, Germany), was consistently utilized alongside suction and irrigation for all procedures. The surgical toolkit encompassed periosteal elevators, both straight and curved dissecting scissors, angled gaspers, and nerve hooks. Application of bipolar or monopolar cautery ensured homeostasis. The primary soft-tissue retractor was the telescoping sheath furnished with a terminal fenestrated guard, while supplementary retractors such as Langenbeck, Czerny, or, on occasion, the Killian retractor, were also employed for enhanced retraction. The cases did not involve the utilization of carbon dioxide or balloon dilation. The majority of procedures were conducted with the author operating the endoscope with their left hand while employing their right hand for the maneuvers. Assistance not involving endoscopy was enlisted solely for tissue retraction.

Procedure categories	Details of the surgery (procedures performed)	Total
Removal of vascular malformation	Removal if the venous malformation using intaoral approach(5)	10
	Removal and clipping of aneurysm in the supraorbital artery (5)	
Cosmetic procedures	Lifting of the mid-face sagendoscopically (7)	21
	Lifting brow for treating brow ptosis(14)	
Fixing fractures	Repositioning of the fracture in medial orbital region and placing the nasal septal graph (8)	12
	Reconstructing the depressed fracture in the frontal bone (4)	
Tissue harvest	Ninth rib harvest (5)	30
	Flap harvesting -Latissimus dorsi (7)	
	Muscle harvesting- Rectus abdominis (10)	
	Harvesting Tailored fascia lata (3)	
Removal of subcutaneous lumps	Harvesting nerve- Sural nerve (5)	60
	Forehead osteoma removal (10)	
	Removal of subcutaneous tumor in neck and head(16)	
	Removal of osteoma in the skull base(10)	
	Removal of lipoma(tender mass) from forehead (2)	
	Removal of lipoma(tender mass) from the muscle of chest (3)	

	Removal of branchial fistula (6)	
	Removal of fibroedema from breast (6)	
	Removal of lipoma (tender mass) from the lower jaw (3)	
	Removal of sebaceous cyst from the cheek (4)	
Placements of implants and expanders	Implanting chin for recessed chin (7)	18
	Implantation of breast to treat breast hypoplasia (5)	
	Ear tissue expander to treat congenital ear deformity (3)	
	Tissue expander for depressed scar in thigh and arm (3)	
Miscellaneous	Transfer of temporalis muscle endoscopically(5)	50
	Inserting fat dermis graft to treat Romberg disease (5)	
	Reducing bilateral masseter by intaoral route (13)	
	Intraoral endoscopic bilateral masseter reduction (11)	
	Inserting graft of dermis graft for depressed area in the cheek(5)	
	Release of the congenital torticollis transaxillary (7)	
	Release of the entrapment neuropathy in the intraorbital nervw (4)	

Result

A total of 201 procedures were performed on 200 patients over a decade (Table 1). Out of 201 procedures 164 surgeries aimed to achieve reconstruction of the damaged or injured tissues, and only 37 were done for aesthetic reasons. The patients were above 1 year and below 60 years. There were 116 female patients in total, and 84 were male patients. In all of the cases the procedures were successfully completed and not left behind during the open surgery. In one instance, a big epidermoid cyst on the cheek necessitated changing the access from intraoral to sideburn margin, subcutaneous. A transient paralysis of the facial nerve of the frontal branch occurred after the excision of an external angular dermoid; this complication healed over the course of three months. The procedure took between 20 and 190 minutes to complete. With experience, the length of surgery for a specific procedure and the series gradually decreased. Except in one instance, pain levels were continuously below 4. In every case, including the one with the patient who had transient nerve palsy the satisfaction scores were always high. For the face, 60 cases of the top third and 35 cases of the centre face 21 lower third treatments were performed endoscopically. There were 21 cases of endoscopic procedures in the neck region, totalling 137 cases done in the head and neck region. 28 endoscopic operations were carried out on the chest, and 42 operations were performed on the abdomen and the lower limbs. In four endoscopic procedures, a dermis graft was placed endoscopically in a patient's depressed right cheek region, and a silicone chin implant was placed intraorally with the use of endoscopy (vertical incisions). Table 1 provides a category-by-category summary of the processes carried out. The following are the two representative cases: One is a new technique for removing pervasive vascular malformation, while the other is a novel component of new flap cover technology. In both instances, there have been gratifying results with scars that are either imperceptible or barely noticeable.

Case1

The surgical removal of a cheek vascular malformation—A blue swelling on her right cheek was evident in a 27-year-old, unmarried woman. A venous malformation was diagnosed in the right cheek it was established based on the surface colour Doppler results and clinical evidence of blanching under pressure and compressibility.

An intraoral treatment was proposed since the patient refused to put on an external scar and consequently found it difficult to get access through a subciliary incision. Using a Killian nasal forceps the soft tissues were removed endoscopically by intraoral route and excision of the deformity was separated from the surrounding soft tissues and feeder vessels were cauterised with bipolar cautery.

Interwoven mass of vascular abnormality was removed. No scar was visible externally.

Case 2

Endoscopic harvesting of the upper rectus abdominis muscle. A 30-year-old male who was in a car accident lost the skin and surrounding muscles on his right ulnar forearm. The extensor pollicis longus, right thumb metacarpal, extensor pollicis brevis tendons, the first web and the skin of the dorsum of the thumb, were absent. There was also a segmental loss of the ulnar artery.

He chose a pedicled flap after receiving guidance on the dangers of performing a free-tissue transfer in a forearm with a single artery. Due to the amount of tissue, a groin flap was explored but ultimately not considered since it would have made it difficult to get over the first web and looked unsightly. A unique approach was used to cover the exposed portions of the distal thumb with an endoscopically harvested, at umbilicus the upper flap of rectus abdominis was delivered and skin-grafted. The muscle flap was split after a month.

After splitting the muscle, the flap was cut along the mid-dorsal axis of the right thumb six weeks later. Electrocautery was used to stop the bleeding after the muscle split.

For improved bony contact, a dorsal strut was placed across the dorsum of the proximal phalanx when inserting iliac bone graft which was 5.2 cm. The bone graft was secured with a 4-hole plate and screws distally and two screws proximally. Disassembling the external fixator was done. The whole bone transplant survived, most likely because to the muscle's abundant blood supply.

A split abductor pollicis longus tendon gap arthroplasty was performed on the first carpometacarpal (CMC) joint a year after the initial procedure. Opposition was reported at degree 10, A year after that he did arthroplasty interposition with silicon-carved block, with a resulting 35 degrees of opposition at the neo-CMC joint. He can now hold things and use a pen to write. The thumb has a sleek look and mild pigmentation. Scars are not noticeable.

Discussion

Abdominoplasty, face lifts, and endoscopic transaxillary and transumbilical breast augmentation procedures were soon reported [4–7]. The excision of benign tumours [8], decompressive fasciotomy for extremities compartment syndrome[9], retrieval of spare body parts like tendon[10], vein[11], or nerve [12] grafts, and many more plastic surgical procedures were soon laid out.

Torticollis and dermoid, particularly in youngsters, are congenital abnormalities that have benefited from the endoscopic technique [13]. It is now possible to directly or indirectly mend facial fractures [14]. The remote insertion of tissue expanders [15] utilising endoscopy to harvest local or free visceral flaps[20], adipofascial [17] and muscle flaps [18,19]

A multiport approach is used by endoscopic surgeons, which results in more minor scarring. The largest barrier to the advancement of subcutaneous endoscopic surgery has been instrumentation, particularly for keeping subcutaneous gaps made by dissection closed. The superior rectus abdominis muscle was harvested and used as an interpolation flap, this technique served two purpose firstly, vascular flap covered the exposed bone and early healing was reported and there was no weakening of the abdominal wall, as both the anterior and posterior sheaths were left behind, this was a novel approach. Fascia lata was harvested strategically to lessen the chance of thigh muscle herniation. Due to axillary approach there constricting bands were observed at the congenital torcillus, this necessitated the use of another approach and so during the robotic surgery transaxillary was preferred over axillary.

The unavailability of instruments or retractors to hold the voids made by dissection in three dimensions has prevented endoscopy from being widely used for subsurface treatments. The subsurface endoscopic techniques now in use, which are based on a laparoscopic approach, have been clarified in this work. As an individual operating surgeon with an inexperienced assistant, the author employs a single port for the majority of patients and two ports for muscle harvesting.

Conclusion

In this paper, different types of endoscopic surgeries were performed to address a variety of problems. The surgeries were successful in addressing the problems, and there were no scars or pain associated with the surgery after the procedure. Subcutaneous Endoscopy in Plastic and Reconstructive Surgery can be revolutionized utilizing expandable tunnel retractors and minirobotics. Training the doctors and personnel involved in the surgery can make the process more efficient and accurate.

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