

# A Surgical Alternative in the Treatment of Hypopharyngeal Perforation

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**Summary:** Pharyngo-esophageal perforation is a rare, life-threatening complication of anterior cervical discectomy and fusion surgery with an incidence estimated to be between 0.2 and 1.51%. Early diagnosis and appropriate treatment of this complication is the key to reduce morbidity and mortality, as the main prognostic factor is the interval between the onset of the fistula, diagnosis and treatment. Conservative management has shown encouraging results in small and localized defects, whereas surgical approaches using flaps are to be considered for most of the cases. However, there is no clear consensus on the first choice of treatment in esophageal perforation. This case report presents the use of a supra-clavicular fascio-cutaneous pedicled propeller flap as a patch combined to primary repair of a hypopharyngeal perforation, 10 years after anterior cervical spine arthrodesis. (*Plast Reconstr Surg Glob Open* 2022;10:e4029; doi: 10.1097/GOX.0000000000004029; Published online 14 January 2022.)

A 30-year-old patient with a history of tetraplegia for 10 years, due to a firearm injury in his spine (C6), treated with an uncomplicated cervical arthrodesis from C5 to C7 in 2010, presented at our hospital with progressively increasing dysphagia. The patient presented at first dysphagia for liquids, which had extended after a few days to solids. A nasopharyngeal fibroscopy was performed and showed a large papillomatous lesion that was thought to be at the upper limit of the esophagus. This was further explored with a CT scan identifying a postero-lateral hypopharyngeal lesion, and was confirmed by an endoscopy showing a part of the osteosynthesis material perforating the hypopharynx between the fifth and seventh cervical vertebrae (Fig. 1).

A multidisciplinary team meeting was established between the plastic surgery, neurosurgery, and visceral surgery teams, and resulted in a surgical decision, involving the withdrawal of the arthrodesis and primary repair of the hypopharyngeal defect associated with a coverage of the sutures using a fascio-cutaneous supra-clavicular island flap.

## SURGICAL TECHNIQUE

With the patient in a supine position and the neck in extension, a right cervicotomy was performed to access

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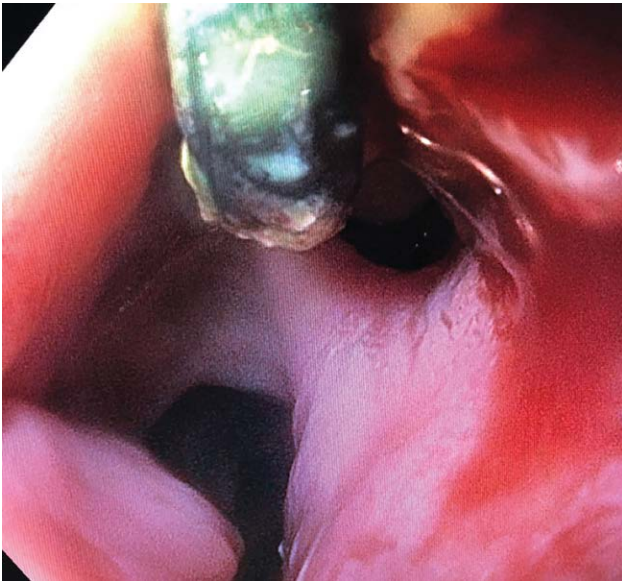
the cervical arthrodesis. The material was visualized protruding the right postero-lateral hypopharynx from the fifth to the seventh cervical vertebra.

The posterior border of the hypopharynx was detached from the vertebrae, and the material was removed, leaving a gap in the vertebral body. The right cervicotomy was extended to a bilateral cervicotomy, allowing a complete mobilization of the hypopharynx-larynx and cervical esophagus, clear visualization of the 4 cm wide posterior defect of the hypopharynx, and primary repair of the defect using interrupted absorbable sutures.

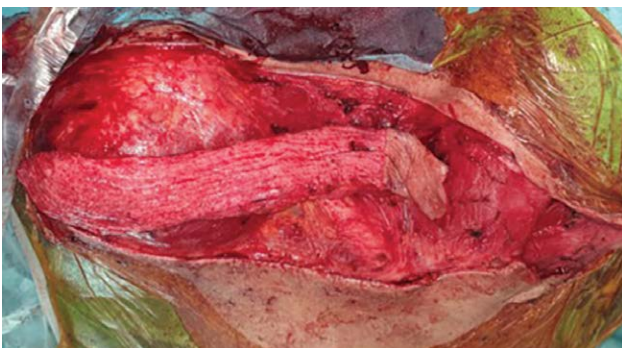
The supra-clavicular paddle was then drawn on the right side, starting from the cervical base to the shoulder, measuring 18 cm in length and 6 cm in width (See figure 1, Supplemental Digital Content 1, perioperative markings of the supra-clavicular paddle. <http://links.lww.com/PRSGO/B885>). The supra-clavicular artery was localized anatomically in a triangle formed by the dorsal edge of the sternocleidomastoid muscle (SCM), the clavicle, and the external jugular vein: more precisely 8 cm laterally from the sterno-clavicular joint, 2 cm inferiorly to the SCM, and 3 cm above the clavicle. An incision was performed along the drawings, until reaching the fascia. The paddle is deepithelialized on most of its length, leaving a square piece of epidermis measuring 4 x 6 cm above the pedicle. Subfascial dissection was meticulously performed from distal to medial, visualizing progressively the supra-clavicular artery and its branches. Given the thinness of the patient, the vascular pedicle had to be skeletonized until its emergence from the transverse cervical artery (Fig. 2). Digital

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**Fig. 1.** Endoscopic imaging showing the osteosynthesis material perforating the postero-lateral part of the hypopharynx over 4 cm between the fifth and seventh cervical vertebrae.



**Fig. 2.** Perioperative view of the deepithelialized and harvested supra-clavicular flap.

dissection of the SCM muscle was performed to allow the supra-clavicular paddle to pass through, and to be placed as a patch between the hypopharyngeal suture and the infected vertebrae over a surface of 6 x 4 cm. The paddle was rotated 180 degrees anti-clockwise from its original position, passed through the SCM muscle, and fixed contralaterally on the contralateral cervical fascia (Fig. 3A, B). Attention was given to obtain minimal tension on the pedicle. The donor site was then closed primarily distally and a thin skin graft was placed medially to complete the closure.

Because of the extended mobilization of the hypopharynx, a tracheostomy was performed. Enteral nutrition was ensured through a jejunostomy.

### POSTOPERATIVE CARE

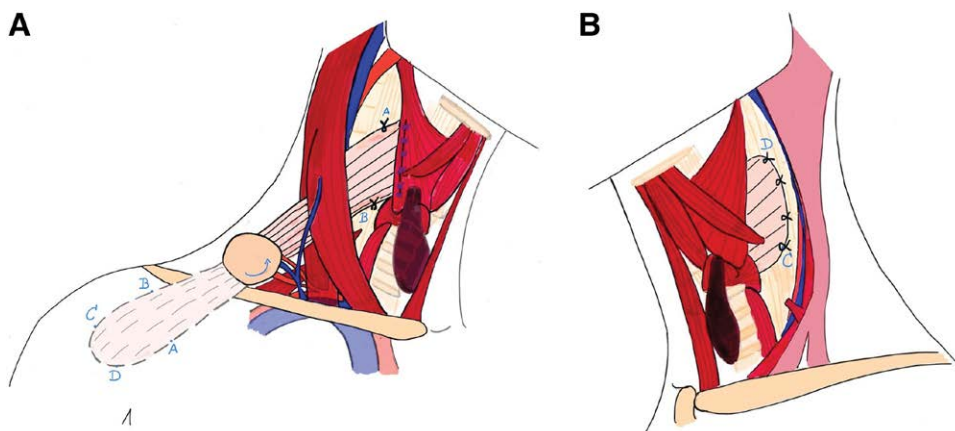
The patient was positioned in a supine position with his head rotated to the right side for 3 days. He received enteral nutrition from day 1 postoperatively. A control Rx OED was performed on day 6 and excluded any leakage from the hypopharynx. On day 7, an oral diet was successfully reestablished, and no further enteral nutrition by jejunostomy was needed. The pain was handled by paracetamol IV: 1 g four times per day.

Monthly follow-up was scheduled, and the patient has not experienced any recurrence of dysphagia for the last 12 postoperative months. A CT scan at 6 months postoperatively showed no signs of hypopharyngeal breach.

Postoperative result at 1 year is shown in Supplemental Digital Content 2 (See figure 2, Supplemental Digital Content 2, anterior postoperative view at 1 year. <http://links.lww.com/PRSGO/B886>).

### DISCUSSION

Management of an hypopharyngeal perforation has been developed to reduce the morbi-mortality of this complication.<sup>1,2</sup> Harman et al proposed an algorithm for the treatment of these perforations by classifying them according to their time of onset and the size of the defect.<sup>3</sup>



**Fig. 3.** Drawings of the placement of the supra-clavicular flap. A, Right lateral view. B, Left lateral view. A, B, The paddle is turned as a propeller flap and placed as a patch between the hypopharyngeal suture and the infected vertebrae over a surface of 6 x 4 cm. A, Points A and B demonstrate how the flap was rotated anticlockwise at 180 degrees. B, The paddle was fixed contralaterally on the contralateral cervical fascia, shown by the points C and D.

According to them, conservative treatment could only be suggested for small perforations (<1 cm) diagnosed at an early stage (within 1 month) and in patients with minimal symptoms, whereas surgery should be considered in other cases. The surgical treatment of localized hypopharyngeal perforations consists of primary suturing of the esophageal defect. It is also recommended to remove any infected hardware and consider posterior cervical fixation to stabilize the spine if bone fusion is still not achieved in cases of associated vertebral defect, with or without muscle flap interpositioning.<sup>1,4</sup>

Many flaps have been described and validated in the literature for hypopharyngeal reconstruction, with the most common technique of soft tissue coverage being the radial forearm flap.<sup>5</sup> Other free flaps such as the anterolateral thigh,<sup>6</sup> jejunal, and omental flaps have also proven their effectiveness in consequent defects.<sup>1</sup> Regional alternatives include the sternocleidomastoideus muscle flap, which is related to multiple advantages: a well-known topography, proximity of the pharynx and the cervical esophagus, ease of dissection, medium pliability, and robustness.<sup>1,2,4</sup>

Good results have also been reported with other flaps, including longus colli flaps, infrahyoid muscle flap, and pectoralis major pedicled flaps.<sup>1</sup> Also, the supra-clavicular artery island flap (SCAIF) has gained in popularity in the recent years.<sup>6,7</sup> This flap has proven to have the same benefits as the anterolateral thigh or radial forearm flap, with the advantage of being a regional flap without any need of vascular anastomosis.<sup>8</sup>

In our experience, we believe that the supra-clavicular flap represents a valuable alternative to the other options already used for this indication. In fact, it provides a thin layer of vascularized tissue to fill the narrow space between the esophagus and cervical spine without bulkiness that could cause dysphagia. Other advantages of the SCAIF are its simple and quick harvesting time, less demanding post-operative surveillance compared with a free tissue transfer, and its mild donor site morbidity with a primary closure for a width less than 7 cm. This flap is a good alternative for patients presenting with a bilateral negative Allen's test, or in difficult recipient neck vessels.<sup>9</sup>

The interposition of this flap between the esophagus/hypopharynx and the spine helps cover the suture, preventing any esophageal leakage on the spine. It also protects the esophagus/hypopharynx from chronic compression by surrounding tissue, and ensures a coverage of the replaced hardware in case of spine instability. Moreover, the SCAIF allows antibiotic delivery to the reconstructed site through its vascularization, improving wound healing.

However, the use of this flap has some reported limitations in head and neck reconstruction. According to

Kokot et al, a flap length greater than 22 cm is associated with distal flap necrosis. Indeed, the supraclavicular fascio-cutaneous flap is limited by its arc of rotation and by its vascular pedicle. In addition, the vascularization of this flap may be inadequate in smokers and patients with multiple medical comorbidities.<sup>10</sup>

## CONCLUSIONS

This case report contributes to the literature describing the use of a supraclavicular fascio-cutaneous propeller flap for the treatment of an esophageal perforation following anterior cervical spine surgery. There has been growing interest in the supra-clavicular rotational island flap in the past few years for head and neck reconstruction due to its easiness for dissection, pliability, low donor site morbidity, and proximity to the neck. In this case report, we emphasize the use of this flap for the treatment of localized posterior hypopharyngeal defects.

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