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HEAD AND NECK

Parapharyngeal space tumours: video-assisted minimally invasive transcervical approach

Tumori dello spazio parafaringeo: approccio transcervicale video-assistito mini invasivo

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SUMMARY

The purpose of the present study was to evaluate the advantages of a video-assisted, minimally invasive transcervical approach to benign and malignant parapharyngeal space (PPS) tumours. Ten patients affected by benign and malignant PPS neoplasms underwent a combined transcervical and video-assisted minimally invasive approach, using Hopkins telescopes. We describe the operative technique and perform a review of the literature. Definitive histology revealed 3 pleomorphic adenomas, 2 schwannomas, 2 metastatic papillary thyroid carcinomas, one carcinoma ex pleomorphic adenoma, one cavernous haemangioma and one basal cell adenoma. Mean tumour size was 37.2 mm (range: 19-60). Operation time ranged from 75 min to 185 min (mean: 146.7). One case was converted to transcervical-transparotid approach. Patients were discharged on postoperative day 2-5. One patients presented hypoglossal nerve paresis. The minimally invasive video-assisted transcervical approach is safe and feasible for selected benign and malignant PPS tumours. Furthermore, it offers harmless dissection in a deep and narrow space, accurate haemostasis and continuous control of critical anatomic structures.

KEY WORDS: Parapharyngeal space tumour • Video-assisted • Endoscopic • Pleomorphic adenoma • Papillary thyroid cancer

RIASSUNTO

L'obiettivo dello studio è stato valutare i vantaggi di un approccio transcervicale mini-invasivo video-assistito per l'exeresi di neoformazioni maligne e benigne dello spazio parafaringeo. Sono stati trattati 10 pazienti con approccio trans-cervicale mini-invasivo video-assistito con l'utilizzo di telescopi di Hopkins. Viene descritta la tecnica chirurgica e una revisione della letteratura. L'esame istologico definitivo è stato in 3 casi di adenoma pleomorfo, in 2 casi di schwannoma, 2 metastasi linfonodali da carcinoma tiroideo, un carcinoma ex adenoma pleomorfo, un emangioma cavernoso ed un adenoma a cellule basali. La dimensione massima delle neoformazioni è stata in media di 37,2 mm (da 19 a 60 mm). Il tempo chirurgico è stato dai 75 ai 185 minuti (media 146,7). In un caso è stata necessaria la conversione ad approccio transcervicale-transparotideo. I pazienti sono stati dimessi dalla seconda alla quinta giornata postoperatoria. In un caso è stata osservata paresi definitiva del nervo ipoglosso. L'approccio trans-cervicale mini-invasivo video-assistito è sicuro e offre la possibilità di seguire esattamente il piano di clivaggio, permettendo un'emostasi accurata e avendo sempre il controllo delle strutture anatomiche più critiche.

PAROLE CHIAVE: *Tumori spazio parafaringeo • Video-assistito • Endoscopico • Adenoma pleomorfo • Carcinoma tiroideo*

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Introduction

Parapharyngeal space (PPS) is classically described as an inverted pyramid-like area with the floor at the skull base and apex at the greater horn of the hyoid bone. The tensor-vascular-styloid fascia divides PPS into prestyloid and retrostyloid compartments.

Neoplasms arising in the PPS are rare tumours accounting for 0.5 to 1% of all head and neck masses [1]; 82% are benign and 18% are malignant: pleomorphic adenoma is the most common histotype (29%).

Most PPS lesions need first-line surgical treatment performed with a transoral, transcervical, transparotid, or transmandibular approach, alone or in combination.

Recently, endoscopic and robotic approaches have been widely applied in head and neck surgery to minimise tissue trauma and wound-related complications and improve cosmetic outcomes. Reports on their use in PPS surgery are extremely limited.

Materials and methods

Patients

Ten patients with PPS tumours were treated with transcervical video-assisted surgery at the Department of Otorhinolaryngology – Head and Neck Surgery of the University Vita-Salute San Raffaele, Milan, Italy from July 2012

to March 2015. Mean age was 58.2 years (range: 42-72). The opportunity to opt for a video-assisted approach was mainly evaluated with magnetic resonance imaging (MRI): we enrolled only patients affected by tumours smaller than 6-7 cm in their largest diameter and with a definite cleavage plane from nearby structures.

Only 4 patients were symptomatic (Table I). Diagnostic workup included contrast-enhanced MRI. Computed tomography (CT) was required in 4 cases for better radiological assessment. Preoperative ultrasound-guided fine needle aspiration cytology (FNAC) was performed in 3 patients: directly on the PPS mass in 2 cases and on a cervical node in the other.

Operative technique

All procedures were performed under general anaesthesia by the same surgical team. As previously described [2,3], video-assisted dissection is performed through a minimal cervical incision (depending on the tumour size) made in a natural skin crease, approximately 3 cm below the mandibular angle at the level of the digastric muscle. The aim of this approach is to reach the whole PPS through a small anatomical corridor, wide enough to allow use of an endoscope and some endoscopic instruments. A skin flap is elevated in the subplatysmal plane. The submandibular gland is retracted anteriorly and the tail of the parotid gland posterosuperiorly. The posterior belly of digastric muscle could be divided or cranially retracted. The hypoglossal nerve is then identified and preserved.

The next steps are performed under assistance of 0° and 30° Hopkins telescopes using a high definition camera. During video-assisted surgical steps, the second surgeon keeps the telescope: this allows the first surgeon to use both hands. The third surgeon provides a wider surgical field using retractors. Operative room setup is shown in Figure. 1.

Thereafter, the internal carotid artery is identified. Tumour dissection is performed upwards and circumferentially in an extracapsular plane: nearby vessels and nerves are carefully retracted from the mass. At this point, the suction-dissector becomes a useful tool to maintain a bloodless surgical field. The tumour is then released and removed en bloc. Endoscopic inspection confirms the completeness of the resection. The posterior belly of the digastric muscle is reapproximated if previously divided. A suction drain is placed inside the wound, which is closed in layers. The drain is removed as soon as daily drainage falls below 20 ml: the patient can be discharged the day after.

Results

Gender, age, operating time, tumour size, pathology and postoperative stay are detailed in Table I. Median surgical incision was 67.1 mm (range: 35-140). Tumour size ranged from 19 mm to 60 mm in maximum diameter (mean: 37.2 mm) and markedly affected operation time, which ranged from 75 to 185 minutes (mean: 146.7 min). Definitive histology revealed benign neoplasms in 7 patients and malignant tumours in 3 cases. The drain was removed from postoperative day 2 to 5 and patients were discharged the following day on regular diet.

In particular, patient 6 suffered from a residual, permanent deficit in tongue motility since he was affected by hypoglossal nerve schwannoma. PPS tumour dissection was concomitant to revision thyroidectomy and homolateral selective neck dissection (II-IV, VI levels) in patient 5, as

Table I. Patients and operative features.

Case	Ages	Sex	Presenting symptom	FNAC	Radiological tumour size, mm	Incision Length, mm	Operative time, min	Pathology	LOS, days	Complications
1	53	F	Thyroglobulin elevation	Pap	36x14x19	56	170	Pap	6	None
2	53	F	Dysphagia	NA	46x45x31	48	165	PA	4	None
3	57	F	None (Occasional at MRI)	NA	19x17x15	35	75	Hem	4	None
4	72	F	None (Occasional during clinical examination)	NA	43x40x35	85	105	PA	3	None
5	42	F	Laterocervical swelling	Pap	31x15x16	140*	170*	Pap	4	None
6	60	F	None (Occasional during MRI)	NC	25x22x17	48	130	Schw	4	Hypoglossal paresis
7	70	M	None (Occasional at CT)	NA	20x13x12	44	125	BCA	5	None
8	56	F	Laterocervical swelling	NA	57x50x30	108**	180**	PA	5	None
9	65	F	None (Occasional at MRI)	NA	35x30x25	42	162	Schw	4	None
10	54	F	Left otitis media with effusion	NA	60x59x27	65	185	Ca ex-PA	3	None

**Procedure included selective neck dissection (levels II-IV, VI) and revision thyroidectomy.*

*** Procedure converted to open transcervical-transparotid approach*

LOS = length of stay; Hem = cavernous haemangioma; Pap = papillary thyroid carcinoma; NC: not conclusive; PA = pleomorphic adenoma; Schw: schwannoma; BCA: basal cell adenoma; Ca ex-PA: carcinoma ex pleomorphic adenoma; NA = not available

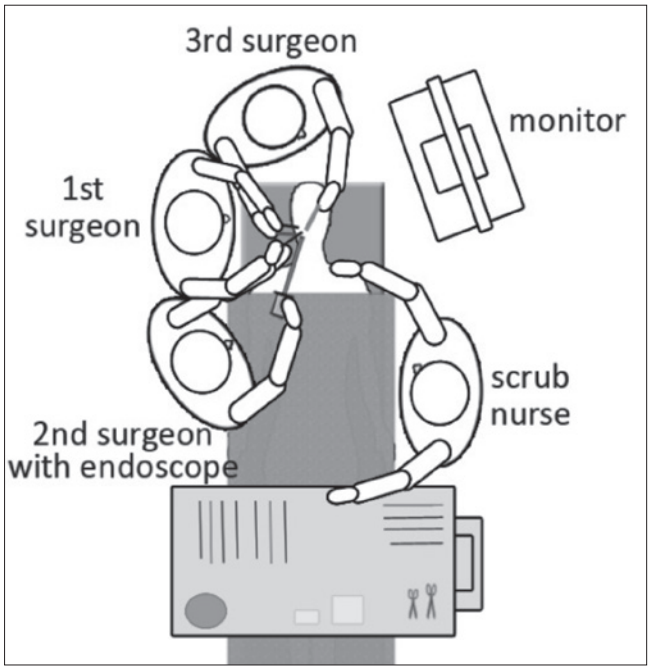

Fig. 1. Operative room setup during video-assisted steps.

he was affected by metastatic papillary thyroid cancer: incision length and operative time were longer. Skull base adhesion of the mass made conversion to transcervical-transparotid approach unavoidable in patient 8. Therefore, excluding cases 5 and 8, median incision length was 52.9 mm (range: 35-85) and mean operative time was 139.6 min (range: 75-185).

After a mean follow-up period of 22 months (from 2 to 37 months), neither radiologically nor clinically relapse was detected into the PPS.

Discussion

Surgery is the mainstay of treatment of most PPS tumours. The anatomic complexity (Fig. 2) of the PPS had led to the development of several surgical approaches. Tumour size, proximity to cervical neurovascular structures and histotype should guide the surgeon in tailoring the strategy for treatment.

The transcervical approach is commonly used for most PPS neoplasms [4]: it provides good local disease control with minimal risk of facial nerve injury and good cosmetic results. However, it is not considered safe for masses with significant vertical extension or radiological suspicion of invasion of cranial foramina [5].

The transparotid approach is used for tumours of the deep lobe of parotid gland [6]. It offers a wide access to PPS, but the risk of facial nerve injury is higher due to its unavoidable extensive dissection and retraction during the procedure [2 7].

Many authors [8-10] have addressed the need for additional approaches to obtain oncologically safe results, such as mandibulotomy. In particular, Malone et al. [10] described 40% of combined techniques. The transmandibular ap-

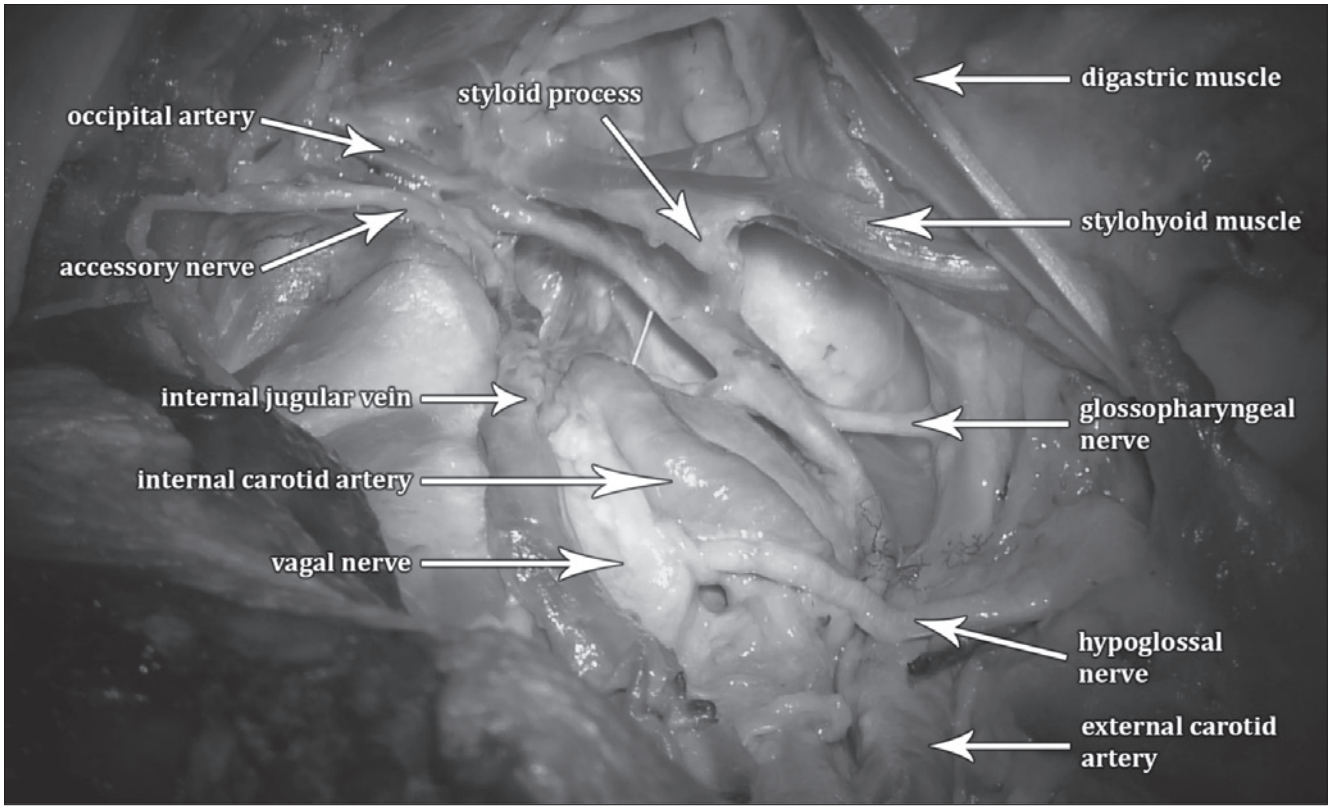

Fig. 2. Anatomy of the PPS.

proach ensures very wide exposure of the PPS and should be considered for highly vascularised neoplasms, recurrent tumours, malignant masses and lesions invading the skull base. However, it should be kept in mind that this technique often results in important nerve injuries, malocclusion and malunion [2].

The orbitozygomatic-middle fossa approach is another technique reported in literature, although it has been described for a restricted number of extremely large tumours involving the skull base [11].

The transoral approach is the most controversial. It provides limited, direct access to the PPS and makes identification of neurovascular structures more difficult. Moreover, it is linked to a higher risk of intra-surgical tumour rupture, incomplete removal of the mass, uncontrollable haemorrhage and facial nerve injury [4].

Some authors [12] suggested robotic transoral resection for large benign masses that are accessible from the oropharynx and involving the poststyloid space. This approach offers a high rate of disease control and a low risk of post-operative complications, such as lockjaw or cranial nerve injuries.

Endoscopic visualisation has been introduced relatively recently in order to obtain better neoplasm control and improve wound cosmetic outcomes. Dallan et al. [13] identified some critical surgical landmarks in endoscopic transoral PPS dissection of six fresh human cadaver heads. Another anatomic study was conducted by Taniguchi et al. to assess the feasibility of an endoscopic transnasal route [14]. The first endoscopic PPS approach on a living person was published in 2010 for paediatric transnasal abscess drainage [15]. Subsequent reports were published with transvestibular [16], transoral [17] and transcervical [2] approaches for benign PPS tumours.

The traditional transcervical approach provides very limited surgical exposure to the PPS: in fact, it is 5-6 cm deep from the cutaneous surface (Fig. 3d). Surgeons are forced to work in a long, dark and narrow tunnel. Digital exploration and digitoclasia are certainly helpful, but direct visual control is not possible during these operations.

The goal of this early experience was to appreciate the advantages of an endoscopic approach, especially from the surgeon's perspective. Using 0° and angled telescopes it is possible to constantly check relationships between the mass and nearby vessels or cranial nerves. The close visual control and magnification of the image allow the surgeon to follow the tumour surface, easing the recogni-

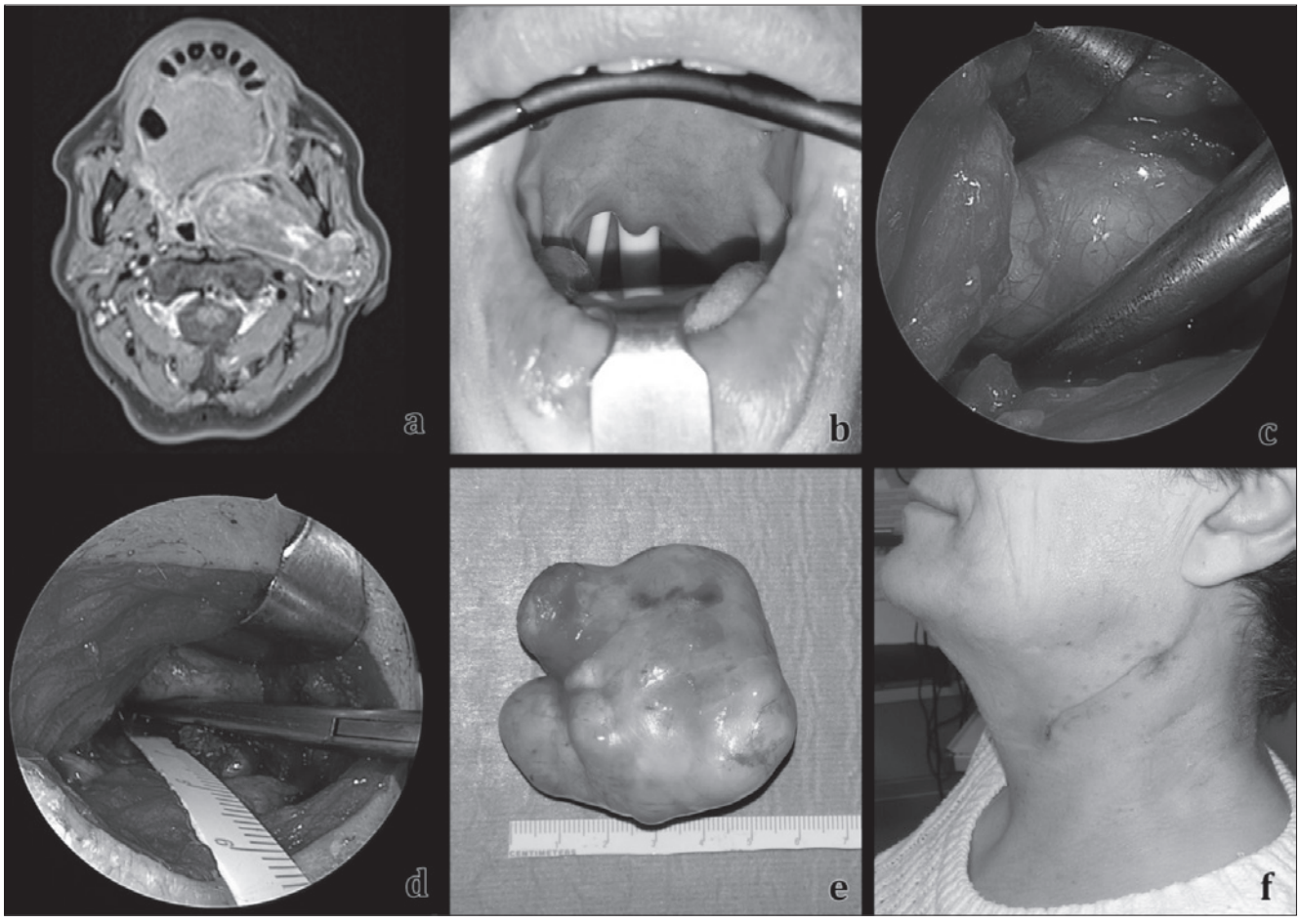

Fig. 3. Case 10: A, pre-operative RMN; B, medialisation of the left pharyngeal wall; C, video-assisted dissection of PPS tumour using suction-dissector; D, demonstration of the deep and narrow surgical tunnel for PPS tumours dissection; E, surgical specimen; F, aesthetic result on postoperative day 11.

tion of cleavage planes, even in lobulated neoplasms. This latter feature reduces the risk of tissue spillage that could have dramatic consequences even for benign lesions.

The video-assisted technique simplifies the identification of small vessels, allowing accurate haemostasis. Furthermore, using the suction-dissector (Fig. 4) it is possible to work in a near-bloodless surgical field due to one-hand simultaneous or alternate dissection and aspiration.

In our series, the nature and the dimensions of the masses markedly influenced operation time. Average surgical time (146.7 min) was similar to that reported by Beswick et al. [2] (133 min) in the only video-assisted PPS tumour dissection previously reported in the literature.

Hospitalisation time was similar to our non-video-assisted approaches, but was higher than that reported by Beswick et al. [2], perhaps due to our prudential attitude in removal of drains.

In summary, a minimally invasive video-assisted transcervical approach should be considered for PPS tumours smaller than 7 cm in their largest diameter. In our opinion, histotype is not an indication itself: even selected malignant neoplasms could be excised with this technique if a definite cleavage plane is recognisable and if the histotype does not require removal of marginal healthy tissues around the mass. We effectively treated three malignant tumours: 2 expected nodal metastases of thyroid papillary carcinomas and an occasional carcinoma ex pleomorphic adenoma. In all these cases surgery was definitive. Nonetheless, after our preliminary experience we would not recommended this technique for malignant masses invading adjacent tissues: a video-assisted minimally invasive transcervical approach cannot offer sufficient access to PPS. Furthermore, we consider it dangerous to use a video-assisted approach for hypervascular tumours (e.g., paragangliomas).

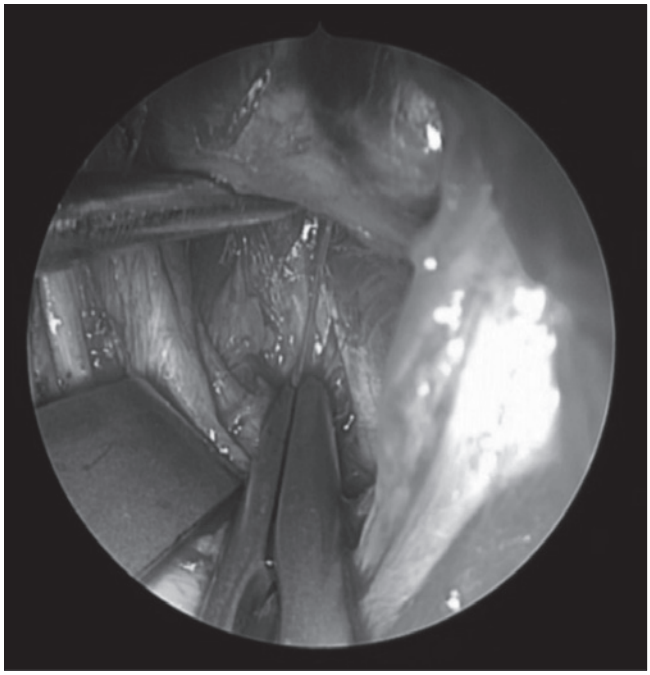

Fig. 4. Video-assisted dissection of PPS tumour (patient 2) from pre-vertebral fascia using suction-dissector.

Conclusions

A minimally invasive video-assisted transcervical approach is a new technique for excision of sizable benign and selected malignant PPS tumours. It allows clear identification of critical surgical landmarks and guides the dissection through the right cleavage plane, offering the chance for accurate hemostasis while decreasing surgical complications.

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