How to do it

Cervico-thoracic tumors resection through transmanubrial osteomuscular sparing approach

Lorenzo Spaggiari a,*, Luca Calabrese b, Giugliano Gioacchino b, Ugo Pastorino a

aDepartment of Thoracic Surgery, European Institute of Oncology, Via Ripamonti 435, 20141 Milan, Italy
bDepartment of Head and Neck Surgery, European Institute of Oncology, Via Ripamonti 435, 20141 Milan, Italy

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Abstract

Twelve patients with cervico-thoracic tumors underwent transmanubrial approach during a 1-year period. All but two patients with NSCLC (n = 8), had double approaches. Three cases with cervical esophageal cancer underwent TMA and laparotomy. The last patient underwent TMA for cervical fibrosarcoma. One patient underwent subclavian artery resection, while another one resection of the left brachicephalic vein with graft replacement. Two cases, in the esophageal cancer group, had laryngeal nerve palsy requiring temporary tracheostomy. TMA affords an excellent exposure of the thoracic in/outlet allowing extended resection. Sparing the main osteo-muscular structures, it respects shoulder mobility of the scapular girdle, thus avoiding deformities due to clavicle resection. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

Among the different surgical approaches proposed to resect cervico-thoracic tumors, the transmanubrial osteomuscular sparing approach (TMA) [1] is a reliable alternative to avoid postoperative deformities of the transclavicular technique [2,3] with excellent results in terms of surgical field exposure and extended resections. Besides, the possibility to associate TMA with other ‘muscle sparing’ or ‘classic’ thoracic or laparatomic approaches have improved its versatility.

This paper presents our preliminary experience in the use of this less invasive cervico-thoracic approach underlying its versatility in approaching different tumors.

2. Materials and methods

Over a period of 1 year until May 1999, 12 patients (ten men and two women; average, 56 years; range, 24–74 years) with different cervico-thoracic tumors (non-small cell lung cancer (NSCLC), n = 8; cervical esophageal cancer, n = 3; fibrosarcoma, n = 1) underwent surgical resection through TMA alone or combined with thoracotomy or laparotomy.

The technique, previously described [1], consists of an L-shaped skin incision along the anterior edge of the sternomastoid muscle and two fingers below the clavicle. Sternomastoid and major pectoral muscle’s insertions on the clavicle are spared.

After the division of the internal mammary vessels, an L-shaped section of the manubrium associated with the resection of both the first rib cartilage and the costo-clavicular ligament are performed; thus, an osteomuscular flap (manubrium edge, clavicle, sternomastoid and major pectoral muscles) is lifted [1].

Subsequently, the subclavian vascular axis and its branches as well as the brachial plexus can be exposed and eventually en-bloc resected with the tumor.

According to the different tumors and locations, a muscle sparing anterolateral or posterolateral thoracotomy, midline sternotomy and hemiclamsheil approach can be associated with TMA with the aim to perform radical lymph node dissection and anatomic lung resections. A median laparotomy without thoracotomy has been recently used to perform esophagectomy.

The manubrial osteosynthesis is achieved with absorbable sutures, thus without any ostoarticular or muscular sacrifice.

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3. Results

The clinical and pathological data are summarized in Table 1. In the NSCLC group, six patients underwent subadventitial subclavian artery dissection and one patient had arterial resection and reconstruction by an end-to-end anastomosis; this patient received preoperative radiotherapy and she underwent palliative surgery because of unsuspected vertebral invasion. The last patient underwent left brachiocephalic vein resection and replacement with a 8 mm PTFE graft.

Three patients underwent larynx-preserving esophageal cancer resection combining TMA with laparotomy. Preoperative studies included total body-CT scan, PET scan, esophagoscopy, echo-endoesophagoscopy and upper digestive tract radiograms to stage the disease.

TMA proved excellent for isolation, extended cervical nodal dissection and pharyngo-gastric anastomosis (Figs. 1 and 2). TMA and laparotomy allow esophageal resection without thoracotomy decreasing the operative time and probably postoperative morbidity.

Two patients developed laryngeal nerve palsy after esophageal stripping and required temporary tracheostomy. To avoid this complication, the last case underwent section of vagus nerves just after the origin of the laryngeal nerve by a mediastinoscope inserts through TMA. No other postoperative complications were observed.

The functional recovery of the scapular girdle and the manubrium stability were good in all patients as were the cosmetic results.

4. Discussion

The resection of the clavicle provides excellent exposure of the cervico-thoracic area as has been previously demonstrated by vascular surgeons [2]. However, clavicle and muscular resections may determine serious shoulder deformities [4,5].

The technical modifications of the transclavicular technique does not prevent the functional and anatomic alterations of the clavicle resection [6,7], even the re-implant of the clavicle may lead to late insufficient fixation or fracture of the stumps [7], with pseudoarthrosis, chronic pain and, finally, instability of the scapular girdle.

In contrast, TMA offers wide surgical exposure with the

<table>
<thead>
<tr>
<th>No.</th>
<th>Age/sex</th>
<th>Approach</th>
<th>Resection</th>
<th>c/pTNM</th>
<th>Histology/LN</th>
<th>Outcome (months)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>50 M</td>
<td>R-TMA/ALT</td>
<td>RUL + 1st, 2nd, 3rd ribs, subadventitial SA dissection</td>
<td>T4*N0M0/T4N0</td>
<td>LC/sq/8</td>
<td>Alive (8) NED</td>
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<td>2</td>
<td>49 M</td>
<td>R-TMA/ALT</td>
<td>RUL + 1st, 2nd, 3rd, 4th ribs, subadventitial SA dissection</td>
<td>T4*N0M0/T4N0</td>
<td>LC/adk/26</td>
<td>Alive (8) WD</td>
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<td>3</td>
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<td>R-TMA/ALT</td>
<td>RUL + 1st, 2nd ribs, subadventitial SA dissection</td>
<td>T4*N0M0/T4N0</td>
<td>LC/sq/11</td>
<td>Alive (6) NED</td>
</tr>
<tr>
<td>4</td>
<td>62 M</td>
<td>R-TMA/ALT</td>
<td>RUL + 1st, 2nd ribs, subadventitial SA dissection</td>
<td>T4*N0M0/T4N0</td>
<td>LC/sq/16</td>
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<td>5</td>
<td>67 M</td>
<td>L-TMA/ALT</td>
<td>LUL 1st, 2nd ribs, BP(C8-D1) resection, subadventitial SA dissection</td>
<td>T3N0M0/T4N0</td>
<td>LC/sq/18</td>
<td>Alive (10) NED</td>
</tr>
<tr>
<td>6</td>
<td>43 F</td>
<td>L-TMA</td>
<td>Exploratory, SA resection (direct anastomosis)</td>
<td>T4*N0M0/T4Nx</td>
<td>LC/adk/Nx</td>
<td>Alive (5) WD</td>
</tr>
<tr>
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<td>37 M</td>
<td>L-TMA</td>
<td>Redo-surgery, cervicothoracic lymph node dissection</td>
<td>N1/N0</td>
<td>LC/adk/10</td>
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<td>67 M</td>
<td>L-TMA/ALT</td>
<td>LUL, 1st rib + partial sternal resection, left brachiocephalic vein resection, (8mm PTFE graft)</td>
<td>T4N0M0/T3N0</td>
<td>LC/sq/16</td>
<td>Alive (1) NED</td>
</tr>
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<td>9</td>
<td>67 M</td>
<td>R-TMA, laparotomy</td>
<td>Total esophagectomy, pharingo-gastro anastomosis</td>
<td>T2N0M0/T2N1</td>
<td>EC/sq</td>
<td>Alive (9) NED</td>
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<tr>
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<td>L-TMA, laparotomy</td>
<td>Total esophagectomy, pharingo-gastro anastomosis</td>
<td>T2N0M0/T2N0</td>
<td>EC/sq</td>
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<td>62 M</td>
<td>L-TMA, laparotomy</td>
<td>Total esophagectomy, pharingo-gastro anastomosis</td>
<td>T2N0M0/T2N1</td>
<td>EC/sq</td>
<td>Alive (5) NED</td>
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<td>25 F</td>
<td>R-TMA</td>
<td>1st rib, cervical dissection</td>
<td>/</td>
<td>Fibrosarcoma</td>
<td>Alive (9) WD</td>
</tr>
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* R-TMA, Right transmanubrial approach; L-TMA, Left transmanubrial approach; PLT, posterolateral thoracotomy; ALT, muscle sparing antero-lateral thoracotomy; RUL, right upper lobectomy; LUL, left upper lobectomy; BP, brachial plexus; SA, subclavian artery; c/pTNM, clinical/pathological TNM; *T4, clinical suspicion (preoperative CT thoracic scan) of subclavian artery involvement; LN, number of mediastinal lymph nodes resected; LC, lung cancer; EC, esophageal cancer; sq, squamous cell carcinoma; adk, adenocarcinoma; WD, with disease; NED, no evidence of disease.
Fig. 1. Right transmanubrial approach. This patient underwent larynx-preserving esophageal resection with extended cervical lymph nodes dissection.

Fig. 2. Left transmanubrial approach. Extended cervical dissection and larynx-preserving oesophageal resection; reconstruction by a pharingo-gastric (greater curvature tube) end-to-end anastomosis.
possibility to perform en-bloc extended resection with no osteo-muscular sacrifices associated with good functional outcome. Its versatility, has progressively increased surgical indications compared to the initially published applications [1].

In fact, TMA has been recently used to treat early-stage cervical esophageal cancer with the idea of improving nodal dissection, avoiding morbidity associated to thoracotomy and increasing at the same time the exposure offered by classic manubrial splits.

Using TMA an extended cervical and upper mediastinal lymph node dissection as well as a pharingo-gastric anastomosis have been performed. In the last patient, the section of the laryngeal nerve before esophageal stripping by using the mediastinoscope was able to avoid the laryngeal nerve palsy.

In lung cancer the need of anatomic lung resection and radical lymph node dissection require a further approach according to the tumor location.

In this setting, we have recently adopted TMA plus antero-lateral ‘muscle sparing’ thoracotomy for anterior situated apical chest tumor without changing the patient’s position on the table during operation. With these two approaches we have had a reduction of the operative time with a less invasive procedure for the patient.

Preliminary data did not show approach-related complications; the follow-up period is too short to reach any oncologic considerations in the use of TMA for NSCLC even though a European study is in progress.

Even though the choice among the different approaches for apical chest tumors is still based on surgeon preference, in our experience extended resections of cervico-thoracic tumors can be accomplished with a safer control and through a wider surgical field by TMA.

References