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RESEARCH ARTICLE

TRACHEAL RESECTION AND ANASTOMOSIS FOR MALIGNANCY: SURGICAL AND FUNCTIONAL OUTCOME

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ABSTRACT

Primary malignant neoplasms of trachea and tracheal invasion by thyroid malignancies although rare are serious causes of morbidity and mortality. Management of tracheal tumours in general includes interventional endoscopy, surgery and radiotherapy. This paper describes the surgical and functional results of tracheal resections done in the surgical oncology department of a tertiary care cancer centre.

Methods: This is a retrospective analysis of all patients with malignant tracheal tumours who underwent resection and anastomosis in the period 2005-2009. Nine consecutive patients with tracheal involvement either from locally invasive thyroid malignancy or from primary tracheal adenoid cystic carcinoma were included in the study.

Results: Six patients had locally invasive differentiated thyroid cancer and three had adenoid cystic carcinoma. The male to female ratio was 2:1. All thyroid cases were papillary carcinoma with involvement of tracheal lumen. These patients underwent thyroidectomy along with tracheal resection- sleeve resection in four patients and window resection in two patients. Among the adenoid cystic carcinoma cases two patients were subjected to sleeve resection and one to window resection. Anastomosis was done after suprahyoid release and digital peri tracheal dissection. There were no major post op complications and all patients had normal voice after surgery. Eight out of nine patients are on regular follow up and are disease free till date.

Conclusion: Tracheal resection is the treatment of choice for tracheal tumours and is a safe procedure with good functional outcome.

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INTRODUCTION

Primary tracheal tumours are rare and the common malignant tumours are squamous cell carcinoma and adenoid cystic carcinoma. Extensive thyroid malignancies can sometimes infiltrate trachea. Tracheal resection and primary anastomosis for such cases is a well-described procedure (Pearson, 1995). Surgery is the first therapeutic option but safety of the patient and healing of the anastomosis are as important as tumour free resection margins (Grillo, 1970). Laryngotracheal invasion worsens the prognosis in thyroid carcinoma and the extent of resection is controversial (Gaissert *et al.*, 2007). This paper describes the surgical and functional results of tracheal resection done for primary and secondary tumours of cervical trachea.

Patients and Methods

This was a retrospective analysis of all patients with tumours involving trachea and who underwent radical surgery as the first therapeutic option from January 2005 to December 2009.

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Nine consecutive patients with tracheal involvement from locally invasive thyroid malignancy or primary tracheal adenoid cystic carcinoma were included in the study.

RESULTS

A total of nine patients underwent tracheal resection surgery in the five year's time from 2005-2009. Six patients had locally invasive papillary thyroid carcinoma with tracheal invasion and three had adenoid cystic carcinoma of the trachea. Among the thyroid malignancy patients, four were males and two were females and among the three primary adenoid cystic malignancy patients two were females and one was a male patient.

All six thyroid cases were papillary carcinoma and two among them were having recurrent disease after a total thyroidectomy from elsewhere. All cases underwent total or completion thyroidectomy and resection of the involved tracheal segment. Four of these patients had nodal disease in the neck and so a selective neck dissection (level II- V) was also performed. The growth was circumferential in four patients and so a sleeve resection was performed for them and afterwards an end to end

anastomosis was done. Two patients had window resection of the tracheal rings.

Table 1. Primary diagnosis

	Total	Male	Female
Papillary carcinoma	6	4	2
Adenoid cystic	3	1	2

Table 2. Surgical procedures done

	Total thyroidectomy	Completion thyroidectomy	Sleeve resection	Window resection
Papillary carcinoma	4	2	4	2
Adenoid cystic carcinoma			2	1

Two out of the three patients with adenoid cystic carcinoma also were subjected to sleeve resection and end to end anastomosis. Maximum length resected was that of four tracheal rings. Sufficient length for the anastomosis was obtained after suprahyoid release and tracheal release from below at the superior mediastinal level by blunt finger dissection. Frozen section examination was done intraoperatively to confirm negative margins. Endotracheal tube was removed on the same day for all seven patients. In two patients it was retained for one more day. Three patients had minimal hoarseness which cleared in a week's time. Two patients showed signs of aspiration and it took two weeks to start them on semisolid diet. Tracheostomy could be avoided in all patients.

There was no incidence of wound infection, pneumonia, pulmonary insufficiency or anastomotic leak in any of the patients. Subcutaneous emphysema was noted in one patient and it got settled after the first week.

Table 3. Complications and outcomes

Complication	No of patients	Outcome
Wound infection	Nil	
Tracheostomy	Nil	
Anastomotic leak	Nil	
Hoarseness	3	Resolved in one week
Aspiration	2	Settled in two weeks
Subcut. emphysema	1	Settled in one week
Granulation tissue	Nil	
Recurrence	1	Re excision done

Final histopathological examination of the specimen showed negative margins in all the cases. Adjuvant radiotherapy was administered to all patients with adenoid cystic carcinoma. All thyroid cancer patients underwent radioiodine ablation. First surveillance bronchoscopy was done one month after surgery as no patients had anastomotic leak. (Fig 1)

All patients are on regular follow up till date except one thyroid cancer patient who is lost to follow up. One patient with papillary carcinoma developed local recurrence in the form of a nodule and underwent wide excision of the same. On last follow up, all eight patients are disease free.



Fig. 1. Post operative picture of the anastomotic site six weeks after the procedure

DISCUSSION

Delay in diagnosis of tracheal tumours occurs mainly because the large lumen of trachea prevents early occlusion by the tumour. Belsey (Belsey, 1950) determined that 75% of the tracheal lumen should get occluded for symptoms to appear. In addition, nonspecific respiratory symptoms are easily confused with other pulmonary diseases leading to delay in diagnosis. In virtually all primary tracheal tumors, complete resection with primary reconstruction of the airways offers the best chance of cure. (Grillo, 1970; Pearson *et al.*, 1984; Perelman and Koroleva, 1974) Most authors recommend the use of irradiation as a single modality of treatment in cases of non resectable diseases alone (Grillo and Mathisen, 1990; Rostom and Morgan, 1978; Fields *et al.*, 1989). Absolute contraindications for tracheal resection include medical contraindications for such extensive surgery. Prior irradiation to the trachea is a relative contraindication and should be accompanied by some type of flap for reinforcement (Pearson, 1995). Human cadaver studies have demonstrated a progressive rise in tension at the anastomosis with increasing length of tracheal resection, suggesting a safe limit of 4.5 cm (corresponding to about 1000 g tension) to avoid anastomotic failure (Grillo *et al.*, 1964; Mulliken and Grillo, 1968).

Most cervical tracheal disease can be approached through a low collar incision or a collar incision combined with an upper partial sternotomy. If a stoma is present, then it is usually incorporated into the collar incision; however, if it is higher than normal, then it can be excised and closed separately (Pearson, 1995; Shields, 1994). While dissecting the trachea, utmost care is taken to preserve tracheal circulation and to avoid necrosis at the anastomotic site. Circumferential dissection of the trachea therefore is confined to the area of disease alone and to no more than 1-2 cm of normal trachea above and below the affected area. This method preserves the lateral segmental blood supply of the trachea. Trachea is first divided and after the diseased segment is removed, cross-field ventilation via the operative field is achieved in the distal trachea. Stay sutures are placed laterally two rings above and below the resected segment and extension is removed. Assessment of tension on the completed anastomosis is carried out with neck in flexed position (Pearson, 1983). In our series we used 1-0 prolene for all anastomosis. Though many studies have shown occurrence of granulations with the use of non-absorbable sutures, we did not encounter any (Cameron *et al.*,

2004). In most cases, neck flexion and anterior mobilization up to the carina will allow a tension-free anastomosis of the cervical trachea (Shields, 1994; Grillo, 2003). Approximately half of the trachea can be safely removed with a low incidence of anastomotic complications (Pearson, 1995). Because of the lack of suitable replacement material for the trachea, (Grillo, 2003) various mobilization and release maneuvers have been demonstrated to increase the length of the tracheal resection by elevation of the carina. These include hilar release, suprahyoid release or suprathyroid release (Dedo and Fishman, 1969) as well as anterior and posterior digital tracheal dissection. Constant neck flexion by a suture between the chin and midline of the chest over the manubrium is also widely considered paramount to successful tracheal resections. An orthosis has also been used as a more comfortable alternative to this traditional suture (Mueller *et al.*, 2004). According to Cameron *et al.* the overall incidences for superficial wound infection, pneumonia and inferior left laryngeal nerve paralysis were 6.2%, 3.1%, and 3.1% respectively. One, three and five year actuarial anastomosis success rates were found to be 96.7%, 93.3%, and 93.3%, respectively (Cameron *et al.*, 2004). Anastomotic complications after tracheal resection and reconstruction are uncommon but can lead to severe morbidity. The important risk factors are reoperation, diabetes, lengthy resections, combined laryngotracheal resections, young age (pediatric patients), and the need for tracheostomy before operation (Gaissert *et al.*, 2007; Cameron *et al.*, 2004).

Adenoid cystic carcinoma (ACC) of trachea, first reported in 1859 by Bill Roth, arises from the glands in the tracheobronchial mucosa. It is characterized by slow growth and unpredictable clinical course (Grillo and Mathisen, 1990). The age and performance status of patients with ACC should also influence the decision for surgery, as ACC is a slow growing tumour (Prommegger and Salzer, 1998). For invasive thyroid malignancy segmental airway resection is a safe procedure, which helps in preserving the voice and relieving airway obstruction. Complete resection of laryngeal and tracheal invasion during or early after thyroidectomy is associated with improved survival. (Laccourreye *et al.*, 1996) Even in the presence of distant metastasis, segmental airway resection may prolong survival and control disease in some patients. Studies have shown that some patients presenting with distant metastasis had a mean survival of six years after segmental tracheal resection. There for a palliative tracheal resection in carefully selected patients is also justified. Airway resection early after thyroidectomy, complete resection, and well-differentiated tumours are associated with improved prognosis (GodehardFriedel *et al.*, 2003). In the present series of nine patients, six had differentiated thyroid malignancy and three had adenoid cystic carcinoma. Sleeve resection or window resection and end to end anastomosis were done for all patients along with suprahyoid release and tracheal lengthening by blunt dissection. There were no incidences of severe wound infection, pneumonia, pulmonary insufficiency, anastomotic fistula or leak for any patient.

Conclusion

Tracheal resection is the treatment of choice for tracheal tumours and is a safe procedure with good functional outcome. Perfect surgical technique is mandatory to avoid anastomotic tension and to preserve the blood supply of the trachea.

Anastomotic complications are uncommon with proper patient selection and the need for tracheostomy is negligible.

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