Swallowing Problems in Post Irradiated NPC Patients

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ABSTRACT

We present three patients with Nasopharyngeal Carcinoma (NPC) developing swallowing problems after radiotherapy as the primary modality of treatment. All patients had advanced stage NPC presenting with enlarged neck nodes and underwent radical external beam radiotherapy. All three patients had both CN X and CN XII palsies and had difficulty in both the oral and pharyngeal phases of swallowing. None of them has any clinical or radiological evidence of local recurrence in the post nasal space and neck or metastasis to the skull base. One patient underwent cricopharyngeal myotomy with epiglottopexy and hyoid suspension which failed and subsequently underwent laryngectomy. Another patient had medialisation thyroplasty and the third underwent a percutaneous endoscopic gastrostomy (PEG).

Keywords: swallowing problems, post irradiation, nasopharyngeal carcinoma

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INTRODUCTION

Nasopharyngeal carcinoma is prevalent in South China and South East Asia particularly amongst Chinese males. In Singapore it is the 5th and 8th most common cancer amongst Chinese males and females respectively in Singapore[1]. The incidence of new cases diagnosed every year is amongst the highest in the world, namely 19 per 100 000 population for males and 9 per 100 000 for females respectively. It is less common amongst the other races here (Malays, Indians and Eurasians).

The primary mode of the treatment in NPC patients is radical external beam radiotherapy over a period of seven weeks (modified Ho's technique). This is usually consists of treatment to the primary site and the neck and a boost to any neighbouring region which has been involved by tumour.

Little attention has been given to the problems post irradiated NPC patients face with swallowing. Usually these problems are not picked up until several months or years after the onset of swallowing difficulties. During this period of time, the patient is at risk of aspiration pneumonia.

We present three such patients in this paper and try to highlight some of the problems we face in managing their aspiration problems. We also discuss our experience with surgery to overcome aspiration in these patients.

CASE SUMMARIES

Case 1

The patient was 39 years old in July 1992 when he was diagnosed with undifferentiated NPC. He presented with a mass in the posterior nasal space with lateral extension into the parapharynx (on CT scan) with bilateral enlarged cervical lymph nodes. He was staged as T2bN2 (1997 AJCC/UICC Stage III) and underwent radical external beam radiotherapy receiving 70 Gy to the nasopharynx, 60 Gy to the neck and a further 9 Gy boost to the cervical lymph nodes by means of 10 MEV electrons. He was well with no evidence of recurrence on follow up until December 1996 when he complained of difficulty swallowing solids and coughing with thin liquids. Cranial nerve examination revealed an isolated lower motor neurone CN XII palsy. Videofluroscopy (VFS) showed abnormality in both the oral and pharyngeal phase of swallowing. Unfortunately he defaulted follow up until August 1998 when he complained of repeated bouts of coughing while drinking water and eating porridge. VFS showed that his dysphagia had worsened. He had premature spillage with nectar and honey consistencies with significant pooling in the vallecula and pyriform fossae. Laryngeal elevation was negligible and there was reduced cricopharyngeal opening. Silent aspiration was present on all attempts of swallow. A Fibreoptic Endoscopic Evaluation of Swallowing (FEES) confirmed the above findings and demonstrated an insensate larynx (Superior

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Table I. Case Summaries.

Patient	Age	Diagnosed	TNM	Stage	Recurrence	Onset of Palsy	Palsies
1	39	1992	T2bN2	Stage III	Nil	52 months	CN XII (4yrs 4 mo)
			® PNS				SLN palsy (6yrs)
2	35	1992	T2aN2	Stage III	Nil	34 months	CN XII (4 yrs)
			(L) PNS				(L) CN X (2 yrs 10mo)
							® CN X (4yrs 9mo)
3	53	1994	T4N2	Stage IVA	Nil	48 months	® CN XII (3yrs 11mo)
			@ PNS				® CN X (3yrs 11mo)

Laryngeal Nerve palsy). The vocal folds were however mobile. Nasogastric tube feeding was commenced and he subsequently underwent percutaneous endoscopic gastrostomy (PEG) in September 1998. Despite repeated attempts to urge him to use the PEG only to feed, he continued to feed orally with consequent aspiration pneumonia. In order improve his quality of life, we decided to perform a definitive procedure to allow him to continue phonating yet simultaneously protecting the competence of his upper airway. A cricopharyngeal myotomy, epiglottopexy and hyoid suspension was performed in October 1998. However, the epiglottis sprung open and the patient continued to aspirate his saliva silently. A total laryngectomy was performed in November 1998. Unfortunately, healing was complicated by anastomotic breakdown and wound dehiscence requiring a pectoralis major flap resulting in prolonged hospital stay and patient depression. However, on discharge he was able to eat per orally. Unfortunately, he passed away shortly after his discharge from hospital.

Case 2

The patient was 35 years old when he was diagnosed to have undifferentiated NPC in June 1992. He was staged as T2aN2 (1997AJCC/UICC stage III) and underwent radical external beam radiotherapy receiving 66 Gy to the nasopharynx in 33 fractions over 47 days. The neck received 56 Gy in 28 fractions over 33 days. In addition, the (L) neck received an additional 14 Gy in 7 fractions over nine days and the ® neck received 6 Gy in 3 fractions over three days. He was well on follow up until May 1995 he presented with hoarseness due to a (L) vocal fold paralysis. There was no clinical or radiological evidence of recurrent disease. A medialisation thyroplasty was performed in January 1996 to improve his voice. However, in August 1996, he presented again with dysphagia and regurgitation with solid foods. VFS showed weakness of the tongue musculature (® CN XII palsy) in the oral phase with pooling of thick liquid and paste in the pyriform fossae with penetration but no aspiration. FEES and VFS were done at regular intervals to assess swallowing function which continued to deteriorate and he began aspirating in spite of swallowing maneuvers. A PEG was performed in November 1996. In April 1997, he developed a ® paramedian vocal fold palsy as well. Sensation in the supraglottic region however remained intact. Presently, he continues to feed via his PEG.

Case 3

The patient was 53 years old when he was diagnosed to have undifferentiated NPC in August 1994. He staged as T4N2 (1997 AJCC/UICC stage IVA) and underwent radical external beam radiotherapy receiving 70 Gy to the PNS in 35 fractions over 42 days. The neck received 60 Gy and the ® parapharynx received a boost of 10 Gy in 5 fractions. He was well on follow up until October 1996 when he started complaining of nasal regurgitation with fluids. Examination showed fibrosis of the soft palate but no cranial nerve weakness. In August 1998, he developed hoarseness. Examination showed ® tongue weakness and wasting (® CN XII palsy) and an immobile ® vocal cord (CN X palsy). There was no clinical or radiological evidence of recurrent disease. VFS and FEES showed that the patient was at risk of aspiration despite swallowing maneuvers. A PEG was performed and the patient is currently feeding through it. Unfortunately, the patient subsequently developed a second primary in the ® base of tongue and underwent ® subtotal hemiglossectomy, total laryngectomy and bilateral modified radical neck dissection in May 1999.

DISCUSSION

All three patients had advanced stage NPC (stage III and IVA). They all received standard radiotherapy treatment to the posterior nasal space with an extra boost to the neck because of neck involvement. Patient 3 also received a boost to the parapharyngeal space. Patient 1 developed superior laryngeal nerve palsy and CN XII palsy while patient 2 and 3 developed both CN XII and X palsy.

Various papers have reported the incidence of cranial nerve palsies in patients who have undergone radiotherapy as the primary mode of treatment. Cranial nerve palsies may either occur alone or in combination. It may also be unilateral or bilateral. The most common cranial nerve involvement is an isolated CN XII palsy. This is followed by isolated CN X palsy. Isolated palsies of CN II, V, and XI have been described but occur less commonly[2,7]. Bilateral palsies of CN X and XII have been reported[5,6]. Combination nerve palsies have also been known to occur between CN X and XI, CN X, XI, XII, and between CN X and XII[2]. All 3 of our patients had multiple cranial nerve palsies involving CN X and CN XII. It is interesting that one patient had bilateral CN X palsy. This was reported also by Takimoto who proposed that this might help distinguish between radiation induced neuropathy and neuropathy from local tumour invasion which tends to cause unilateral damage[5].

After excluding loco-regional recurrence, distant skull base involvement or brain metastasis clinically and radiologically, the site of involvement can be postulated by the pattern of cranial nerve involvement. If the palsies occur singly, it is likely that the site of damage is in the neck whereas if the palsies occur as a group, the damage is possibly at the level of the skull base where the exit out together[2].

The mechanism by which radiation damages cranial nerves is not fully understood. It may occur directly or indirectly. Direct damage by radiation focal nerve degeneration, increased connective tissue and scar formation, vascular changes especially focal capillary obliteration, Schwann cell depletion with resulting functional impairment. It is generally agreed that cranial nerves and peripheral nerves are fairly radio-resistant structures[8]. Hence direct radiation induced cranial palsies are rare. Radiation to the tissues surrounding the nerve may cause marked fibrosis resulting in fibrous thickening of the neurilemma sheath, demyelinisation and fibrous replacement of some nerve fibrils resulting in entrapment[3].

Most papers quote an interval of between 3 to 12 years between irradiation and onset of cranial nerve palsies[2-4,8]. One paper however reported a case where the patient developed CN X palsy as early as 12 months after radiotherapy[2]. Because swallowing difficulties may develop in between follow up schedules, the precise onset may not be accurately documented. So unless asked for specifically, many patients may not volunteer the history of mild disability with swallowing until much later when they present with nasal regurgitation, coughing during meals or with aspiration pneumonia.

In addition to cranial nerve palsies, radiation induces fibrosis of the soft tissues of the neck. This may in turn give rise to 1) restriction in laryngeal movement resulting in poor upper oesophageal sphincter opening, 2) decreased larynx to hyoid approximation compromising airway protection, and 3) poor pharyngeal constriction resulting in pharyngeal residue after swallowing which may be inhaled[9].

It is our routine practice to perform both the FEES and VFS. Both these tests complement each other. All our patients had difficulty in both the oral and pharyngeal phases of swallowing. There was reduced tongue movement, premature spillage in the oral phase and reduced laryngeal elevation, poor cricopharyngeal opening, pooling of residue in the pyriform fossae with both penetration and aspiration in the pharyngeal phase. It is therefore not surprising that our patients had difficulties swallowing all consistencies of material (thin liquids, nectar and honey consistency feeds).

Swallowing maneuvers are effective in overcoming swallowing difficulties related to the oral and pharyngeal phase of swallowing. All our patients were taught chin tuck and supraglottic maneuvers with multiple and effortful swallows. Although these maneuvers did in general reduce the amount of residue pooling in the pyriform fossae, these three patients still continued to aspirate and were deemed unsafe to feed orally. A report suggests that the Mendelsohn maneuver may be the most useful strategy in overcoming aspiration in these patients[10]. We, however find that the Mendelsohn maneuver is difficult to master in our local population.

Patient 1 had a cricopharyngeal myotomy with epiglottopexy and hyoid suspension. We attempted cricopharyngeal myotomy because of the pooling of saliva and residue in the pyriform fossae on VFS and FEES. In addition, there was also poor cricopharyngeal opening on the VFS. Manometric studies were not performed. Cricopharyngeal myotomy has been shown to be effective in managing different etiologies of cervical dysphagia[13-15]. In patients with dysphagia and aspiration caused by combined laryngeal and pharyngeal paralysis, successful management requires attention to both the glottis and cricopharyngeus. Woodson (1997)[11] reported success using simultaneous arytenoid adduction and cricopharyngeal myotomy while Campbell et al (1997)[12] found adjunctive measures such as thyroplasty and superior laryngeal nerve anastomosis effective. Previous studies have shown that, in general, cricopharyngeal myotomy is successful in patients with identifiable motor disorders confined to the pharyngeal phase of swallowing. These include failure of the pharyngeal pump, criocopharyngeal incoordination or incomplete

relaxation[13]. It is not as successful if used alone in patients with multiple cranial nerve palsies[14].

Controversy exists as to whether manometry and cineradiography should be routinely employed in all patients prior to cricopharyngeal myotomy. McKenna and Dedo (1992)[14] performed surgery based on history alone, whereas Ross (1982)[15] believed that preoperative manometry and cineradiography resulted in better patient selection, and improved success rates from the procedure.

In addition to a cricopharyngeal myotomy. Patient 1 had an epiglottopexy performed in order to preserve phonation, normal glottic respiration, and restore the protective function of the larynx. The procedures proposed by Montgomery (1975)[16], Sasaki (1980)[17], Lindeman (1975, 1976)[18,19] restore breathing and swallowing but sacrifice phonation. More innovative methods as described by Bookes and McKelvie (1983)[20], Meiteles et al (1993)[21] achieve protection of the larynx and preserves speech. Using lateral pharyngotomy approach, we initially attempted to tubularize the epiglottis as described by Meiteles et al (1993) but we found the resultant lumen too small to achieve a good airway. Hence, we employed the technique described by Laurian et al (1986)[22] where the epiglottis was closed in a horizontal fashion over the arytenoid cartilages leaving a small lateral opening for respiration and phonation. The hyoid suspension was performed to provide additional protection to the epiglottopexy procedure[19]. Unfortunately, we were unable to obtain success surgically because of a detached epiglottis, resulting in continued aspiration. Although an epiglottopexy may occasionally fail and require revision surgery it is a good procedure that can achieve the dual objectives of preserving laryngeal competence and allowing the patient to maintain phonation.

Medialisation thyroplasty was performed in Patient 2 to improve his voice. Unfortunately, he subsequently developed dysphagia and aspiration. Flint, Purcell and Cummings (1997)[21] advocated the use of medialisation thyroplasty in the treatment of patients with dysphagia and aspiration due to combined superior laryngeal and recurrent laryngeal nerve dysfunction. However, these patients had no other cranial nerve impairment. If medialisation alone failed, they advocated the use of cricopharyngeal myotomy and laryngeal suspension. It is hence obvious that medialisation thyroplasty alone is insufficient to tackle the problem of aspiration if multiple cranial nerves palsies exist. It should therefore only be used as an adjunct to other surgical procedures.

Finally, because these patients are often poor surgical candidates from poor nutrition and wound healing, these procedures are associated with a high risk of morbidity. Hence, they should not be undertaken lightly.

CONCLUSION

1. Delayed cranial nerve palsies may occur any time after the 1st year post-radiotherapy. This is usually due to perineural fibrosis and less commonly to direct damage to the nerve. The sites of damage may either be in the neck or at the level of the skull base.
2. A thorough examination and radiological investigations such as a CT scan or MRI should be employed to exclude a recurrent tumour in the presence of cranial nerve palsies.
3. A complete cranial nerve examination should be routinely performed in all patients on follow up at the cancer clinic. This will enable us to detect swallowing difficulties at an early stage before complications arise.
4. Videofluroscopy and the Fibreoptic Endoscopic Evaluation of swallowing are complementary investigations that should be used to evaluate all patients with suspected swallowing problems. These patients should be fed initially via a naso-gastric tube or PEG while swallowing maneuvers are initiated. If these maneuvers fail, surgical procedures can then be offered to enable the patient to eat orally, thus improving quality of life.
5. There are many surgical procedures that have been described to overcome aspiration. Because more than one cranial nerve may be involved, with resultant glottic incompetency and pharyngeal incoordination, these procedures are usually employed in combination with each other.
6. The selected procedures should be tailored according to the problems patients experience, and the objective that the patient and surgeon hope to achieve at the end of the operation. The decision to perform surgery must not be taken lightly because of the morbidity associated with operating on this special group of patients.

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