INTRODUCTION

The sinus of Morgagni lies between the superior pharyngeal constrictor muscle and the skull base (Fig. 1). Internally it is covered by mucosa and posteriorly by the pharyngobasilar fascia, and it is a route for the spread of neoplasms and infection from the nasopharynx to the base of the skull. Invasion of this sinus results in a collection of symptoms known as Trotter’s syndrome or sinus of Morgagni syndrome.

The pharyngobasilar fascia, also known as the pharyngeal aponeurosis, is bound inferiorly by the superior pharyngeal constrictor, superiorly by the base of the skull, and anteriorly by the posterior border of the medial pterygoid laminae. As the superior pharyngeal constrictor only extends superiorly to the skull base in the midline, the pharyngobasilar fascia serves to attach this muscle to the base of the skull at both the basal part of the occipital bone and the petrous portion of the temporal bone. In this area, superior to the pharyngeal constrictors, the pharyngobasilar fascia also serves to maintain the patency of the lumen of the nasopharynx. The sinus is also closely related to the foramen ovale, the lateral pterygoid muscle and the prevertebral space.

The aim of the present study was to investigate the detailed anatomy of the sinus of Morgagni, quantify this region, and observe important relationships between it and nearby cranial base structures.

MATERIALS AND METHODS

The sinuses of Morgagni from twelve adult formalin-fixed cadavers (24 sides per cadaver) were examined (Fig. 1); five male and seven female cadavers were utilized, with an age range of 47 to 87 years (mean 78...
years). None of the specimens were noted as having prior surgery or noticeable trauma to the region studied. The cadavers were placed in the prone position, and the atlanto-occipital joint was disrupted with a mallet and osteotome. The cadavers were placed in the supine position and the heads brought forward in order to remove the cranium and attached pharyngeal wall from the cervical spine. The sinus of Morgagni was identified as lying between the left and right parts of the most superior aspect of the superior pharyngeal constrictor muscles. Relationships to nearby anatomical structures were documented, and using calipers and rulers, measurements of the length and width of this corridor into the posterior nasopharynx were recorded.

RESULTS

The sinus of Morgagni was identified in all specimens. The length of this area ranged from 1.2 to 2.2 cm (mean 1.8 cm). Its height ranged from 0.4 to 1.0 cm (mean 0.5 cm). The levator veli palatini and tensor veli palatine muscles, and the cartilaginous portion of the Eustachian tube, were found to traverse the pharyngobasilar fascia by passing through the sinus of Morgagni in all specimens. Rare retropharyngeal nodes overlying this area were identified. The distance from the sinus to the foramen ovale was in the range 1.5-2.8 cm (mean 2.5 cm). An intimate relationship existed between the sinus of Morgagni and both the buccopharyngeal and prevertebral fasciae; no dehiscences were identified in the sinus. One left-sided male specimen was found to have an anomalous petropharyngeus muscle crossing posterior to the sinus of Morgagni.

DISCUSSION

The sinus of Morgagni was identified in all specimens. Neoplastic infiltration of this region (Trotter’s Syndrome) can result in ipsilateral conductive hearing loss, ipsilateral akinesia of the soft palate and ipsilateral trigeminal (mandibular) neuralgia. Hearing loss is secondary to compression of the Eustachian tube and can be temporarily relieved by inflation of the tube. In addition, patients often present with a secretory effusion of the middle ear. Akinesia of the palate is secondary to involvement of the levator veli palatini. This is most noticeable when the palate is relaxed rather than contracted, as immobility is due to invasion of the muscle rather than paralysis. Neuralgia is due to the close proximity of the sinus of Morgagni to the foramen ovale. The mandibular nerve, V3, exits the cranium through the foramen ovale, and is responsible for pain in the lower jaw, ear and lateral side of the face. This is supported by our finding that the foramen ovale is found approximately 2.5 cm from the sinus of Morgagni. Owing to the proximity of the sinus of Morgagni to the foramen ovale and the prevertebral fascia, infiltrate injected at, or into, the foramen could enter the plane around the prevertebral fascia, and theoretically enter the mediastinum.

Ultimately neuralgia, a symptom of Trotter’s Syndrome, develops into anesthesia of the aforementioned
areas. As the neoplasm grows, the maxillary nerve, V₂, which passes through the foramen rotundum into the nearby pterygopalatine fossa, may also be affected. In the later stages of disease typical findings include involvement of the maxillary nerve, and trismus, which results from the involvement of the lateral pterygoid muscle.

Neoplastic invasion of the sinus of Morgagni and the resulting metastasis to the skull base and lymph nodes of the carotid and retropharyngeal spaces can be visualized using various imaging techniques including CT and MR. Sakata et al. discovered that MR was superior to CT in identifying involvement of the sinus of Morgagni and the pharyngobasilar fascia. Visualization of these structures is important in determining the stage of nasopharyngeal cancer as the amount of neoplastic infiltration is a more reliable prognostic factor than actual tumor volume. Sakata et al. showed that invasion of the sinus of Morgagni or the pharyngobasilar fascia, as determined by MR, was predictive of future distant metastases even after radiotherapy. The authors also discovered that when an initial MR scan showed a lack of involvement of these structures, this correlated with good local control of the tumor using radiotherapy.

**CONCLUSIONS**

We have quantified the dimensions of the sinus of Morgagni and recorded anatomical relationships with other nearby structures. To our knowledge, this is the first study presenting such data, which could be of use to surgeons who operate in this region.

**REFERENCES**