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TECHNICAL NOTE NON-VASCULAR INTERVENTIONS

Stenting the Upper/Cervical Oesophagus with a Proximal Deployment Cervical Oesophageal Stent: Technique and Outcomes

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Abstract

Introduction Proximal oesophageal stent deployment continues to provide challenges due to the proximity of the upper oesophageal sphincter and the associated subsequent complications such as globus sensation and stent migration. Patients with cervical oesophageal cancer have previously had limited stenting options available to them with a paucity of the literature describing the radiological technique for successfully placing these high-risk stents. In this paper, we present our experience using the Taewoong Niti-S CERVICAL Oesophageal Stent.

Materials and Methods We describe our method for stent deployment highlighting the importance of pre-procedural planning in ensuring an adequate proximal landing zone for the short proximal flare of the stent. Furthermore, we outline how we have adapted our placement technique to incorporate a routine pre-dilatation stage which has optimised retrieval of the proximal to distal deployment system.

Results We have placed eight cervical oesophageal stents within our institution. Contrast swallows in all the patients following stent deployment have demonstrated free flow of contrast to the stomach with all patients reporting symptomatic relief and no foreign body/globus sensation. There has been one episode of stent migration but no incidence of oesophageal perforation or haemorrhage.

Discussion Evolution of stenting technique and the properties of the stents themselves are improving accuracy of stent placement in relation to the important landmark of the upper oesophageal sphincter.

Conclusion Stenting of cervical oesophageal malignancy has proved successful in our institution and provided symptom relief for a subset of palliative patients who were previously unable to benefit from oesophageal stenting.

Keywords Oesophageal stent · Oesophageal cancer · Dysphagia · Taewoong Niti-S CERVICAL Oesophageal Stent

Introduction

Palliative oesophageal stenting improves dysphagia by reducing luminal obstruction allowing ongoing oral calorie intake and management of oropharyngeal secretions. Cervical oesophageal cancer patients have previously had limited available stenting options due to the associated complications [1] including risks of any oesophageal stent placement such as haemorrhage, fistula, perforation and pain [2, 3]. Furthermore, the proximal oesophageal location predisposes to complications such as aspiration pneumonia, globus sensation, stent migration and regurgitation [4], significantly affecting patient quality of life. The

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Taewoong Niti-S CERVICAL Oesophageal Stent (Taewoong Co. Ltd, South Korea) is a nitinol, single silicone covered, self-expanding metal stent designed specifically for this patient subgroup. There have been no previous studies describing the use of this stent. We present our experience in eight cervical oesophageal cancer patients including technique and results, with a description of how we have optimised the procedure by adapting our stenting method.

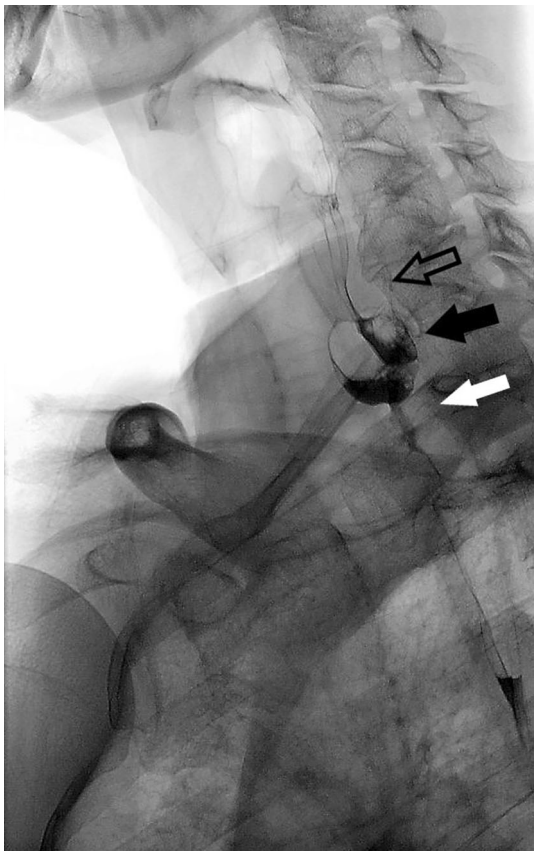

Fig. 1 Planning contrast swallow demonstrating the upper oesophageal sphincter (cricopharyngeus) (open arrow), the 'bubble' marking the proximal landing zone (black arrow) and the start of the stricture (white arrow)

Materials and Methods

Patients have staging computerised tomography (CT) prior to upper gastrointestinal multidisciplinary team discussion. During procedural planning, a high-quality contrast swallow delineates the upper oesophageal sphincter (cricopharyngeus) and the proximal stricture, producing a characteristic 'bubble' appearance (Fig. 1). This 'bubble' segment forms the proximal landing zone for the stent. Over 1 cm clearance from the upper oesophageal sphincter to the top of the stricture ensures an optimal proximal landing zone for the shortened 1 cm proximal flare of the stent with stricture extent determining stent length selection. If required, approximate measurements can be made on the pre-procedural CT (Fig. 2), but the upper oesophageal sphincter is not always clearly identified.

The procedure is performed in a dedicated interventional radiology suite under fluoroscopic guidance. Thorough pre-procedural counselling including written informed consent aids compliance and accurate stent placement. Topical Xylocaine local anaesthetic spray, lateral patient positioning, conscious sedation and continuous observation monitoring are used. A 0.035'' regular angled hydrophilic guidewire (Terumo, Japan) and 6French 40-cm biliary manipulation catheter (Cook, USA) are manipulated through the stricture into the stomach. A 6French 55-cm vascular sheath is inserted, and a slow injection of a small volume of water-soluble contrast (Omnipaque 300) avoids

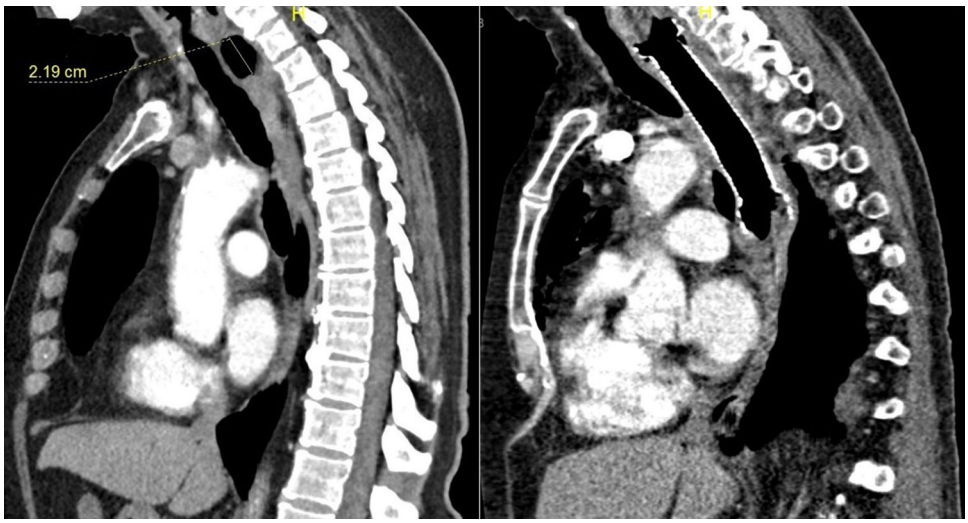

Fig. 2 Pre-procedural staging CT and follow-up staging CT demonstrating the distance from the upper oesophageal sphincter to the proximal end of the stricture

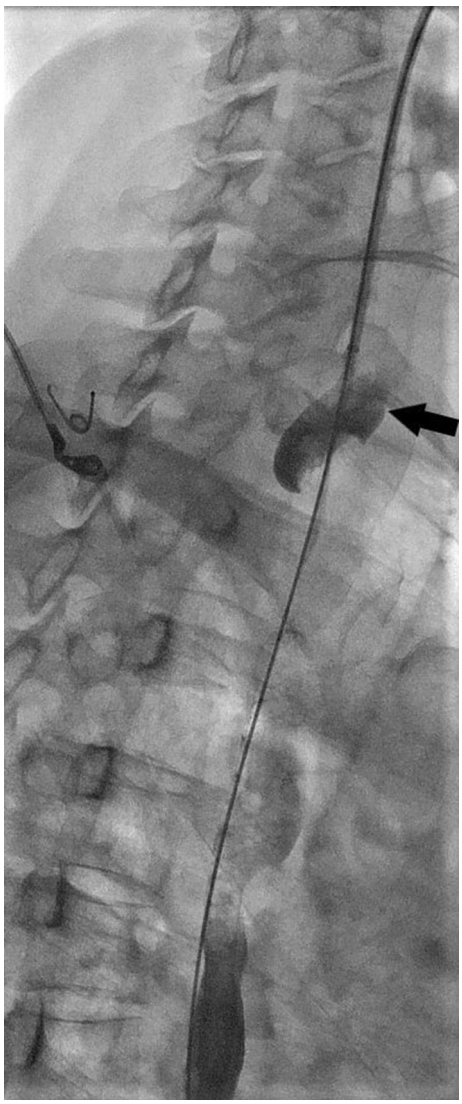

Fig. 3 Following passing the catheter and wire to the stomach, a 6French 55-cm vascular sheath is inserted and contrast is slowly injected to delineate the stricture and confirm the proximal landing zone (arrow)

aspiration, delineates the stricture and confirms the proximal landing zone (Fig. 3). Pre-dilatation with hand inflation using a 12-mm balloon (Cook, USA) optimises delivery system retrieval through the stent lumen (Fig. 4). The proximal stent marker is accurately positioned within the proximal landing zone, and the short proximal flare is uncovered or can be 'pushed' onto the top of the stricture. The remainder of the stent is carefully deployed from proximal to distal (Fig. 5), and the deployment system is retrieved through the stent lumen. Unlike standard stent delivery systems, where the left hand is brought towards the fixed right hand, with this technique the stent is deployed in an opposite fashion by bringing the right hand towards the left hand. Following the balloon dilatation, the

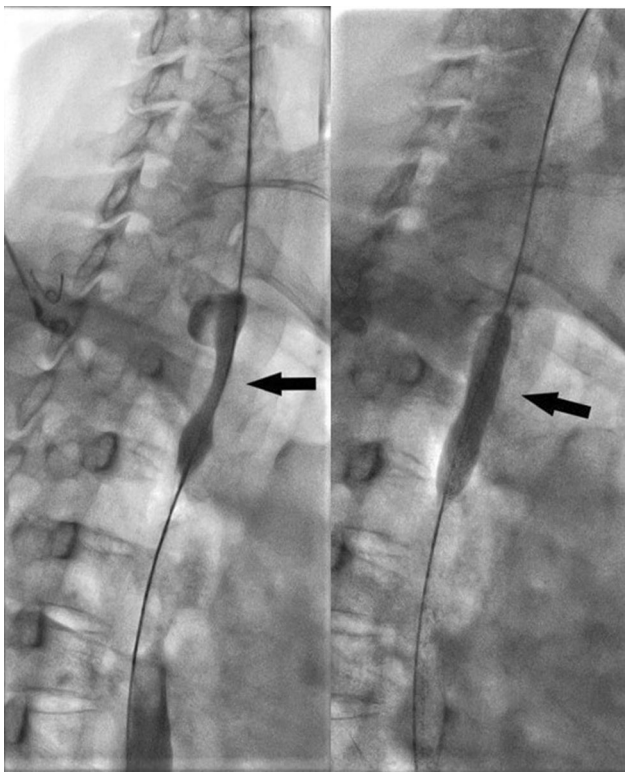

Fig. 4 Pre-dilatation of the stricture with a 12-mm balloon (arrow) demonstrating a waist and with the waist eliminated

delivery system can usually be retrieved easily or by resheathing if there is difficulty. A water-soluble contrast swallow later the same day confirms position and patency and allows clinical and symptomatic assessment of the patient (Fig. 6).

Results

We have placed eight Niti-S CERVICAL Oesophageal Stents (Taewoong Co. Ltd, South Korea) in patients with inoperable cervical oesophageal malignancy, and all procedures were technically successful and optimally sited with no complications such as oesophageal perforation or haemorrhage. The minimum, maximum and mean distances that stents have been sited between the upper oesophageal sphincter and the stricture are 1.5, 7 and 3.7 cm. Post-procedural contrast swallows demonstrated free flow of contrast to the stomach. Patients were assessed for complications, particularly globus, during the swallow, and then closely monitored until death by their oncologists. One case of stent migration within 2 weeks of stenting was managed by placing another stent across the stricture resolving symptoms. Universal improvement in oral intake and dysphagia scores (reducing Mellow–Pinkas-Scores by a mean of two points) occurred with no episodes of globus

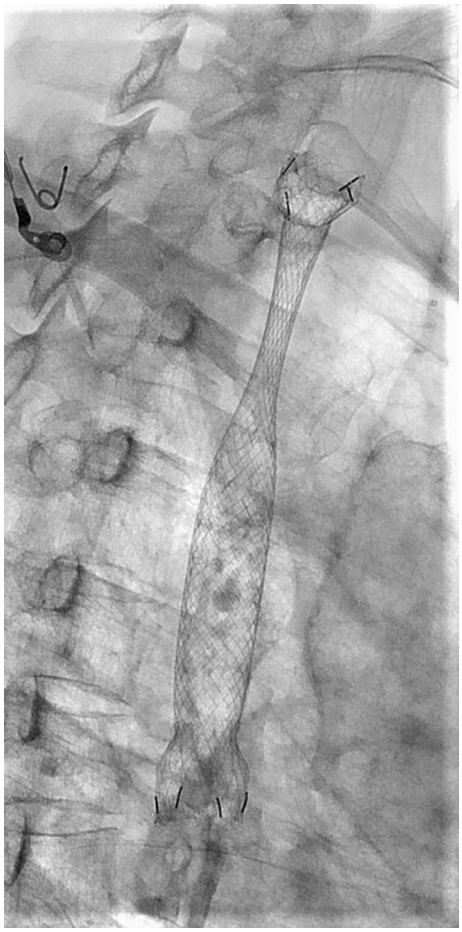

Fig. 5 Fluoroscopic image following deployment of the proximal to distal cervical oesophageal stent

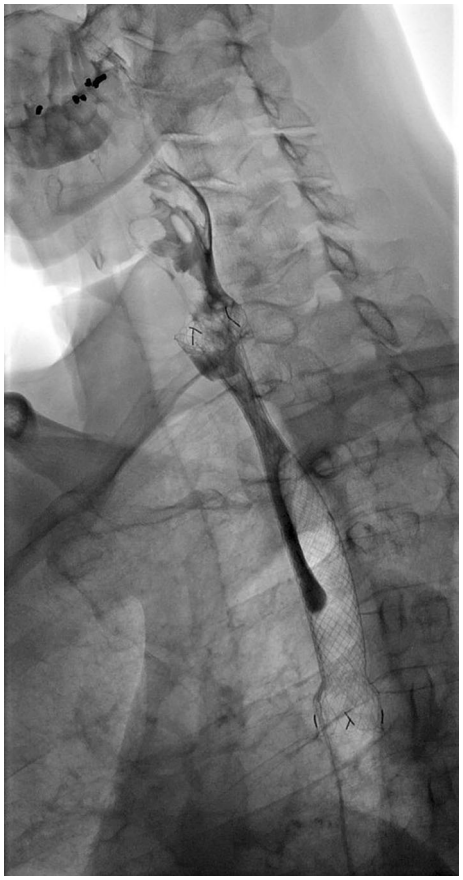

Fig. 6 Checking contrast swallow the same day demonstrates the stent maintaining position with free flow of contrast through

sensation or tumour ingrowth. All patients remained asymptomatic until death and, with the exception of one case of migration which was resolved with a second stent, the stents have lasted the duration of the patient's lives.

Discussion

Previous work demonstrated that cervical oesophageal stenting can be successful particularly in malignant strictures [5–7]. A widely acknowledged key factor in the reduction in potential complications is precision deployment of the proximal end of the stent in relation to the upper oesophageal sphincter. Varying techniques exist, for example direct visualisation with endoscopic deployment [8], combining CT and fluoroscopy during placement [6], using radio-opaque skin markers as landmarks [6, 9] and one reported case of stenting via a gastrostomy [10]. We have found that a good quality contrast study is highly effective for guiding stent placement and always delineates the upper oesophageal sphincter, producing a 'bubble' appearance, which has not been previously described. With experience, formal measurements are non-essential but if required can be calculated from fluoroscopy comparing the height of the bubble with the adjacent cervical vertebra or approximating from the pre-procedural CT. Delineating this landmark and ensuring a 1 cm clearance enable accurate stent deployment within close proximity to the sphincter with no incidents of globus sensation.

Accurate stent positioning is not the only factor contributing to success in this challenging anatomical location; evolution of oesophageal stent properties has increased their application within the proximal oesophagus, for example stents enabling easy retrieval and re-positioning during the procedure [8] and modifications to reduce the proximal landing zone by shortening the proximal flare [11]. Evidence also suggests that incorporation of a shouldered contour maintains optimal position reducing the risk of migration following stent deployment in malignant strictures [5].

Properties of the Niti-S CERVICAL Oesophageal Stent ensure both optimal placement and accurate placement,

hence reducing potential side effects. The development of the proximal to distal deployment system, opposite to the conventional distal to proximal stent deployment, is invaluable with cervical oesophageal stricture stenting because it enables highly accurate, controlled positioning of the proximal landing segment in relation to the upper oesophageal sphincter. However, unlike distal deployment devices, the outer sheath of the delivery system must be withdrawn through the stent lumen after its release. As described previously, we have adapted our technique and incorporated a routine, gentle, subtherapeutic 12-mm balloon pre-dilatation stage. This was included following the first case, where there was difficulty retrieving the delivery system, and has optimised retrieval ensuring accurate stent position is maintained. We have encountered no resultant increase in bleeding or perforation.

The 1 cm short proximal flare allows stent placement within close proximity to the upper oesophageal sphincter and increases the number of patients that can benefit from the procedure. Other important stent features include shouldering proximally and distally to reduce migration, a single silicone covering to reduce tumour ingrowth and a visible green suture at the proximal stent enabling easy removal if required.

Conclusion

The proximal oesophagus continues to provide challenges to stenting; however, with a combination of thorough planning, deployment of next generation stents and precise techniques, we have successfully placed stents within very close proximity to the upper oesophageal sphincter with good symptomatic results and no globus sensation. Two features of the stent: its short proximal flare and proximal deployment system, have enabled us to offer oesophageal stenting to a larger group of patients at our institution. Patients with cervical oesophageal malignancy have previously had few management options available to them, and therefore, we should endeavour to continue working towards providing symptomatic relief despite the challenges posed by the anatomical location.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained before all stenting procedures.

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