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Original Research Article

The use of the paediatric gastroscope to deploy self-expanding metal stents in patients with cancer of the oesophagus at Dr. George Mukhari Academic Hospital

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ABSTRACT

Background: Oesophageal carcinoma continues to be a major cause of cancer related deaths worldwide. Metal stents are an established treatment option for palliation of dysphagia. These stents are classically deployed using endoscopy with fluoroscopic control. An alternative technique is using the paediatric endoscope.
Methods: The study is a retrospective review of all cases of esophageal stenting at Dr George Mukhari Academic Hospital, Pretoria, South Africa were included. A prospectively maintained database Olympus Endobase® is used in the endoscopy suite. All cases between March 2015- February 2018, where the oesophagus was stented were reviewed. Cases where the paediatric scope was used were analysed further. Data captured from the database included demographics, tumour length, the presence of trahceoesophageal fistula.
Results: A total of 233 patients were stented, the paediatric scope was used in 217. The procedure was successfully completed in 84,7% of the patients. Repeat stenting was required in 20 patients. The mean age was 57 years (32-97). Average length of the stricture 9,6cm (5-15cm). The reasons for palliation were patient unfit for surgery (n=159), associated TOF (n=15), unspecified (n=38). The reasons for repeat stenting were stent migration (n=5), tumour overgrowth (n=10) and blocked stent (n=5). Complications were recorded in 1 case where an iatrogenic perforation was caused which was successfully stented. In the 33 cases that failed the reason for failure was inability of the scope to negotiate the stricture. These cases were subsequently completed successfully using a guidewire with fluoroscopy. There was no periprocedural mortality.
Conclusions: It is safe and feasible to use the paediatric endoscope to stent tumours of the oesophagus. If the procedure is successful it prevents the exposure of the staff and the patient to radiation. It ensures reliable placement of the guidewire into the stomach as well as confirming appropriate positioning of the stent.

Keywords: Oesophageal cancer, Paediatric Gastroscope, Stenting

INTRODUCTION

Oesophageal cancer is the second most common cause of death in South Africa.[1] Patients often present with an advanced stage of disease where the cancer is irresectable. Self expanding metal stents (SEMS) are an important modality in offering these patients some palliative care and a reasonable quality of life.[2] Stenting is most valuable for tumours of the middle third of the oesophagus. It is less useful for tumours close to the cricopharyngeus as irritation of the airway may occur. Conventionally SEMS are placed with fluoroscopic

guidance. This allows confirmation that the guidewire has passed into the stomach and is not in a false tract.[3] The endoscopist may also use clips applied internally or externally placed coin or other marker to mark the proximal extent of the tumour when using the fluoroscopic technique. The problem with these techniques is that the clips may dislodge or the patient may move making subsequent deployment of the stent inaccurate.[4,5] Also of concern is the requirement of a C-arm to allow for placement, this presents challenges on resources as well as staff where a radiographer is required. This modality also exposes the staff and the patient to ionizing radiation. Blind placement of SEMS has been described however concern with blind placement includes the risks of perforation of the oesophagus and bleeding.[6-13] This study aims to document the feasibility and safety of using the paediatric gastroscope to deploy SEMS in tumours of the oesophagus. The small diameter flexible scope can be used to negotiate the stricture caused by the cancer directly, allow passage of the guidewire into the stomach under direct vision, confirm the position of the stent while it is being deployed as well as after deployment.

METHODS

The study was registered on research registry UIN number 1883. A retrospective review of the endoscopy database was conducted from March 2015- February 2018. The endoscopy unit uses the Olympus Endobase® system. The database was queried for all patients where the oesophagus was stented using a SEMS. This was further narrowed to cases where the paediatric gastrocope (Olympus Evis Exera III Scope GIF-XP190N) which has an external diameter of 5.4mm was used. The data collected included patient demographics, tumour length, presence of an associated trachea-oesophageal fistula. Failure of the technique was also recorded. The type of stent as well as the length of stent used were recorded. Immediate complications such as bleeding or perforation and mortality were also recorded. Re-interventions were also recorded including the reason for reintervention.

Means (±SD) were presented for continuous variables and frequencies (%) were presented for categorical variables. Continuous variables were tested for normality and if normal, t-tests are used and if not normal, non-parametric tests are used. For our primary analysis, linear regression is used to model the association between X and Y, adjusting for a, b, and c. For secondary analysis examining the presence or absence of logistic regression is used adjusting for a, b, and c. A p of <0.05 was considered significant. All analyses were performed using IBM SPSS 22 software.

Technique

All patients were consented prior to the procedure by the endoscopist. This consent included the need for sedation, the endoscopy procedure and stenting. The stenting was performed in the endoscopy unit with conscious sedation, midazolam, fentanyl and propofol were used at the discretion of the treating physician. The stents used were nitinol partially covered metal stents with a distal release system (Niti-STM Esophageal Stent). An initial gastroscopy was performed with a standard gastroscope and the oesophageal tumour was identified. Biopsies of the tumour were taken as the standard biopsy forceps will not fit through the paediatric gastroscope due to the smaller working channel. Once the biopsies were taken the scope was switched to the paediatric gastroscope. This scope is then negotiated through the stricture in the oesophagus. The scope is then passed into the stomach. A 260cm Boston Scientific Guidewire (JAG-wire) is passed through the scope into the stomach. On removing the paediatric gastroscope the length of the tumour is measured and document so that the appropriate length of stent can be selected. This is 4cm longer than the measured tumour so that 2cm overlap on each end of the tumour is obtained. The stent delivery system is passed until the markings are the same as the proximal extent of the tumour. The paediatric gastrocope is then reinserted alongside the stent delivery system. The "yellow line" marking the proximal end of the stent is visually confirmed.

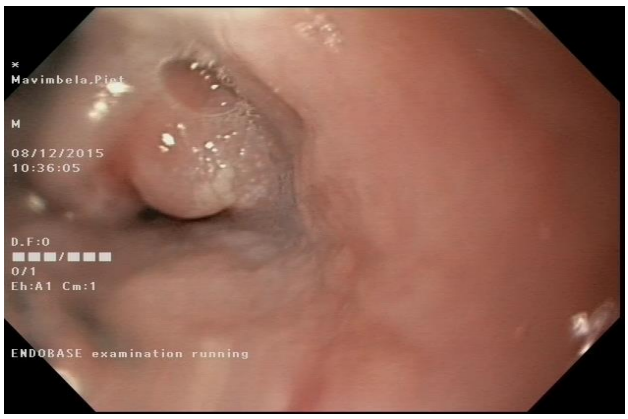

Figure 1: Proximal end of tumour.

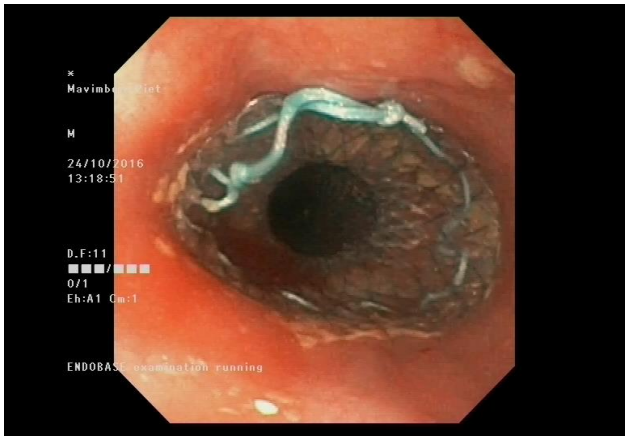

Figure 2: Successfully deployed stent which can be negotiated to confirm appropriate position.

The stent is deployed ensuring the desired 2cm overlap. If the position of the stent is concerning the paediatric scope can be passed through the stent again confirming the position. If repositioning is required, the stent can be pulled back using a biopsy forcep. The patient is then recovered in the ward. The patient is discharged with analgesia and dietary advice. Figure 1-3 show endoscopic views of the technique.

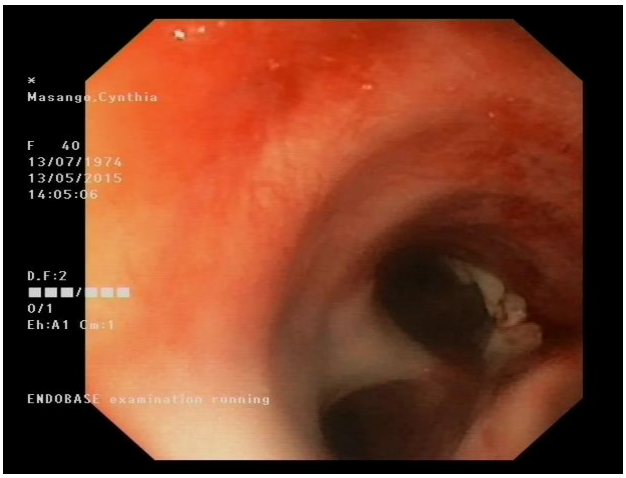

Figure 3: Endoscopic view of TOF showing bifurcation of trachea.

RESULTS

A total of 217 stents were placed using the paediatric scope between March 2015 and February 2018. The procedure was successfully completed in 184 out of 217 patients (84.7%) of the patients. The patients that failed were due obstructing tumours where the paediatric scope could not pass.

All these patients were subsequently successfully stented using the conventional fluoroscopic technique. There were 197 treatment-naive patients and 20 patients with a SEMS that had become obstructed and who required re-stenting. The mean age was 57 years (32-97). There were 65 female patients (29.9%) and 152 male patients (70.0%). In terms of racial distribution, black patients overwhelmingly predominated. There were 212 black patients (97.6%), 3 (1,3%) white patients and 2 (0.9%) Indian patients.

The reasons for stenting were inoperable cancer in n= 212 of the patients. The average stricture length in these patients was 9.6cm (5-15).

In n=5 patients after nutritional rehabilitation, the patients were fit for surgery and went on to have a radical surgical oesophagectomy. These 5 patients had a mean age of 46.8 years (43-50), with a mean tumour length of 4.8cm (3-8), and no evidence of advanced disease on staging CT scan. An analysis of these patients in comparison to those who were resected is presented in Table 1.

Table 1: Comparison between resected and palliated patients.

	Resected n=5	Not resected /palliative n=212	p-value
Age in years (range)	47 (43-50)	57 (32-97)	0.387
Length of structure in centimetres (range)	4.8 (3-8)	9.6 (5-15)	0.421

Total n=15 (6.9%) patients had an associated tracheooesophageal fistula (TOF). The reasons for palliation were patient unfit for surgery (n=159), associated TOF (n=15), unspecified (n=38). Patients were deemed unfit for surgery by the treating clinician for a variety of reasons including nutritional status, metastatic disease, or locally advanced tumours.

Repeat procedures

A total of 20 patients required a repeat procedure, 5 for stent migration, 14 for tumour overgrowth, 1 for a blocked stent. The restent rate was 9,2%. An analysis of this subgroup is presented. Restenting in these patients occurred without problems (Table 2).

Table 2: Repeat procedure.

Reason for repeat procedure	Number of patients	Time to repeat procedure in months (mean)
Stent migration	5	3-7 months (4.1)
Proximal overgrowth	9	5-20 months (10.2)
Distal overgrowth	8	2-7 months (6.0)
Blocked stent	1	8 months

There was no periprocedural mortality. In one patient an inexperienced endoscopist attempted the procedure. He was overly zealous with the scope and caused a false tract with an oesophageal perforation. An experienced endoscopist assisted and was able to negotiate the stricture with the paediatric scope successfully and managed to deploy the covered stent. This patient was inoperable due to locally advanced disease however he made an uneventful recovery in the ward.

DISCUSSION

In South Africa oesophageal cancer is a common cancer with high associated morbidity and mortality rates. This is due to the fact that a large majority of these patients present late with locally advanced or systemic disease. This is borne out in our study in that only 5 out of 233 (2.1%) patients went on to a potentially curative radical oesophagectomy. The majority of patients are therefore palliated. Endoscopically deployed SEMS play a crucial role in this regard. In South Africa and the rest of the world at large the commonest method of deploying these

stents is under fluoroscopic control or blindly. This is the first large scale study demonstrating the safety and feasibility of using a paediatric gastroscope in order to deploy self expanding metal stents to palliate cancer of the oesophagus.

In our setting many patients are referred to endoscopy without a barium swallow, if this were done it would allow the endoscopist some estimation of stricture length. This technique in addition to allowing for the direct confirmation that the guidewire has passed into the stomach also provides us with valuable information with regards to stricture length. This then allows for determination of the appropriate length of the stent.

In terms of this 3-year study the majority of the patients were of poor nutritional health, were of advanced age, or had locally advanced or systemic disease. The patients that were offered resection had shorter strictures (4.8cm vs 9.6cm) p=0.421 and were of younger age (46.8 vs 57 years) p=0.387, although this did not reach statistical significance due to the small numbers in the resection arm. This result is logical as younger therefore fitter patients with shorter strictures were more likely to be amenable to surgery. This problem of having large numbers of patients for palliation is serious and needs to be addressed at a national level. Improved awareness of the symptoms of esophageal cancer is essential so that patients do not present at this advanced stage of the disease.

Table 3: Comparison with other series using direct vision but with adult scope.

	Number of patients	Perforation (%)	Mortality (%)	Migration (%)	Re-stent (%)
Our series	217	0.46	0	2.3	9.6
Govender et al	436	1.4	0	2.5	5.9
Wilkies et al	98	0	0	0	8.9
Soussan B et al	33	0	3	0	18
White RE et al	70	2.8	0	-	4.2

This study shows that an exclusively endoscopic technique using the paediatric gastroscope is possible in the majority of cases (84.7%). If the technique fails, no bridges are burnt and fluoroscopy can still be used to complete the procedure. This was seen in present study where all patients that failed the endoscopic stenting were successfully stented using fluoroscopy. This technique is exceptionally safe with results that are comparable if not better than those reported in other series (Table 3).[7-13]

The only perforation in our series was due to operator inexperience and is entirely preventable. It represents a good alternative to fluoroscopically guided or blind techniques. With a blind technique a higher rate of false tracts is anticipated as well as misplacement. Also, in potentially difficult cases like TOF a blind technique with misplacement of the stent can have disastrous consequences with sudden death of the patient if the stent is deployed in the trachea. Another major advantage is that limiting the use of fluoroscopy reduces the exposure of staff to radiation with its potential risk of malignancy. It also reduces the burden on the radiographers who have multiple roles in the hospital.

Currently our standard procedure when a patient with malignant dysphagia is referred to endoscopy would be to attempt to stent the tumor using the paediatric gastroscope. The role of fluoroscopy has been relegated to a second line procedure at our institute only to be used where stenting with the paediatric scope has failed.

CONCLUSION

Authors have developed a safe and effective technique using the paediatric gastroscope to deploy SEMS in tumours of the oesophagus. Present study shows the technique works in the vast majority of cases and it is exceedingly accurate in deploying the stent. It prevents unnecessary exposure of staff and patients to harmful ionising radiation. This technique is safe in potentially difficult cases such as TOF.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Local ethics committee and UIN 1883

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