

Palliative Treatment of Malignant Inoperable Esophageal Strictures with Self-Expandable Metallic Stents: Single Center Experience with 155 Patients

İnoperabl Malign Özofagus Darlıklarının Kendiliğinden Genişleyebilen Metalik Stentlerle Palyatif Tedavisi: Tek Merkezli 155 Hastalık Deneyim

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ABSTRACT Objective: A retrospective study was designed to investigate the success and the complication rates of different types of self-expandable metallic stents in patients with inoperable malignant esophageal strictures. **Material and Methods:** One hundred fifty five patients with malignant esophageal strictures received self-expandable metallic stents under fluoroscopic guidance in our clinic between the years 1994 and 2008. A total of 137 men and 18 women aged between 26- 83 years (mean age, 58.9 years) were included in the study. Stent types used include Strecker, Wallstent, covered Wallstent, Flamingo Wallstent, Choo Stent and Song Stent. Complications of different stent types and dysphagia scores of the patients were evaluated both prior to the stent placement and afterwards. **Results:** Stent delivery technique was successful in all patients. The average dysphagia score decreased from 3.1 (dysphagia to liquids) to 1.2 (dysphagia to normal solid food) providing a 1.9 improvement in the dysphagia score. In eight cases (5.2%) early complications such as ingrowth and early migration were detected. In 30 cases (19.4%) late complications such as ingrowth, overgrowth, coexistence of ingrowth and overgrowth, late migration, esophago-bronchial fistula and bleeding were detected. **Conclusion:** Placement of self-expandable metallic stents in the palliative treatment of malignant esophageal strictures is an easily applied, well-tolerated and effective method which improves the dysphagia score of the patients with low complication rates. Our results are in agreement with the literature. The selection of the ideal stent for each patient is of great importance.

Key Words: Stents; esophageal stenosis; radiography, interventional; fluoroscopy

ÖZET Amaç: Ameliyat edilemeyen malign özofagus darlığı olan hastaların palyatif tedavisinde kendiliğinden genişleyebilen metalik stentlerin başarısını ve değişik stent tiplerinin komplikasyon oranlarını ortaya koymak için retrospektif bir çalışma yapıldı. **Gereç ve Yöntemler:** Malign özofagus darlığı olan 155 hastaya kliniğimizde 1994 ve 2008 yılları arasında floroskopik kılavuz ile kendi kendine genişleyebilen metalik stentler takıldı. Yaşları 26-83 yıl arasında değişen (ortalama yaş 58.9 yıl) toplam 137 erkek ve 18 kadın çalışmaya alındı. Kullanılan stent tipleri Strecker, Wallstent, kaplanmış Wallstent, Flamingo Wallstent, Choo Stent ve Song Stent'dir. Değişik stent tipleriyle gelişen komplikasyonlar ve hastaların stent uygulanmadan önceki ve stent sonrası disfaji skorları değerlendirildi. **Bulgular:** Stent yerleştirme ile ortalama disfaji skoru 1.9'luk bir iyileşme sağlayacak şekilde 3.1'den (sıvıları yutamama) 1.2'ye (normal katı gıdaları yutamama) düştü. Sekiz olguda (%5.2) malpozisyon ve erken migrasyon gibi erken komplikasyonlar saptandı. Otuz olguda (%19.4) ingrowth (tümörün stentin örgü ağlarından stent içine doğru büyümesi), overgrowth (tümörün stentin üst ve alt uçlarından stent içine doğru büyümesi), ingrowth ve overgrowth birlikteliği, geç migrasyon, özofagobronşial fistül ve kanama gibi geç komplikasyonlar saptandı. **Sonuç:** Malign özofagus darlıklarının palyatif tedavisinde kendi kendine genişleyebilen metalik stentlerin yerleştirilmesi kolay uygulanan, iyi tolere edilen, hastaların disfaji skorunu iyileştiren, komplikasyon oranı düşük, etkili bir yöntemdir. Bizim sonuçlarımız literatürle uyumludur. Her hasta için ideal stentin seçilmesi büyük önem taşır.

Anahtar Kelimeler: Stentler; özofagus darlığı; radyografi; girişimsel; floroskopi

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Esophageal cancer is reported as the sixth leading cause of death from cancer.¹ Most cases are detected at an inoperable stage. Obstruction of the esophagus causes progressive dysphagia, malnutrition and aspiration. In case of inoperable esophageal carcinoma, the primary objective of the therapy becomes to maintain oral nutrition. This can be achieved by the insertion of self-expandable metallic stents as a minimally invasive procedure, which results in immediate elimination of dysphagia.² The use of expandable metallic stents for esophageal strictures was first described by Frimberger in 1983.³ Today palliative treatment with metallic stents is a well-established procedure and there are many different types of covered and uncovered metallic stents on the market some of which with antireflux valves.⁴

In our clinic, metallic stents have been used for the palliation of malignant esophageal strictures since 1992. In this paper a single center's experience with Strecker, Wallstent, covered Wallstent, Flamingo Wallstent, Choo Stent and Song Stent is reported.

MATERIAL AND METHODS

PATIENTS

Between December 1994 and December 2008, 155 consecutive patients with inoperable malignant esophageal strictures received self-expandable metallic stents under fluoroscopic guidance. Stents were placed by radiologists with a minimum of five years of experience in the field of interventional radiology. Informed consent was obtained from every patient prior to the introduction of the stent.

The patient group consisted of 137 men and 18 women aged between 26 to 83 years (mean age, 58.9 years). The diagnosis of the upper gastrointestinal tract obstruction was made by the clinician on the basis of the patient's symptoms and clinical history. The diagnosis was confirmed by the combination of barium study, computed tomography and endoscopy. The histologic diagnosis was made by the help of the endoscopy findings. In our study 55 patients (35.5%) had adeno cancer and 100 patients (64.5%) had squamous cell cancer.

The length of the stricture varied from 3 to 14 cm (mean length, 6.27 cm). In 33 patients (21.3 %) the stricture was located in the lower part of the esophagus, in 43 patients (27.7 %) in the lower end and cardia; in 70 patients (45.2 %) in the middle part, in two patients (1.3 %) in the upper part of the esophagus and in seven patients (4.5%) in the region of esophagoenterostomy.

Dysphagia was graded on a scale of 0 to 4 according to Cwikiel et al.⁵ Patients were graded twice prior to the stent delivery and after the procedure:

Grade 0= normal diet/no dysphagia

Grade 1= ability to swallow semi-solids and liquids

Grade 2= ability to swallow liquids only

Grade 3= difficulty in swallowing liquids and saliva

Grade 4= complete dysphagia

Prior to the stent placement the average dysphagia score was 3.1.

STENT DESIGNS

A total of 196 stents were placed in 155 patients (Figure 1). In five patients whose strictures were longer compared to the stents available, we placed two stents per patient. In 36 patients who developed complications (stent misplacement, migration, ingrowth, overgrowth and fistula) we had to use new stents. Bleeding was the only complication that we did not plan to place a new stent.

In our study, 50 of the stents used (25.5%) were Strecker stents (Boston Scientific Corp, Natick, MA) made up of Nitinol and had a proximal collar.

Forty one of the stents (20.9%) were Wallstent (Boston-Scientific) with flared ends and made up of a stainless steel alloy woven into a tubular mesh (Figure 2, 3).

Thirty four of the stents (17.3%) were covered Wallstent (Boston-Scientific) with an internal silicon-based covering.

Fifty of the stents (25.5 %) were Choo Stent (M.I. Technical, Suwon, South Korea). This is a polyurethane-covered stent made up of Nitinol with a retrievable attached thread (Figure 4, 5).

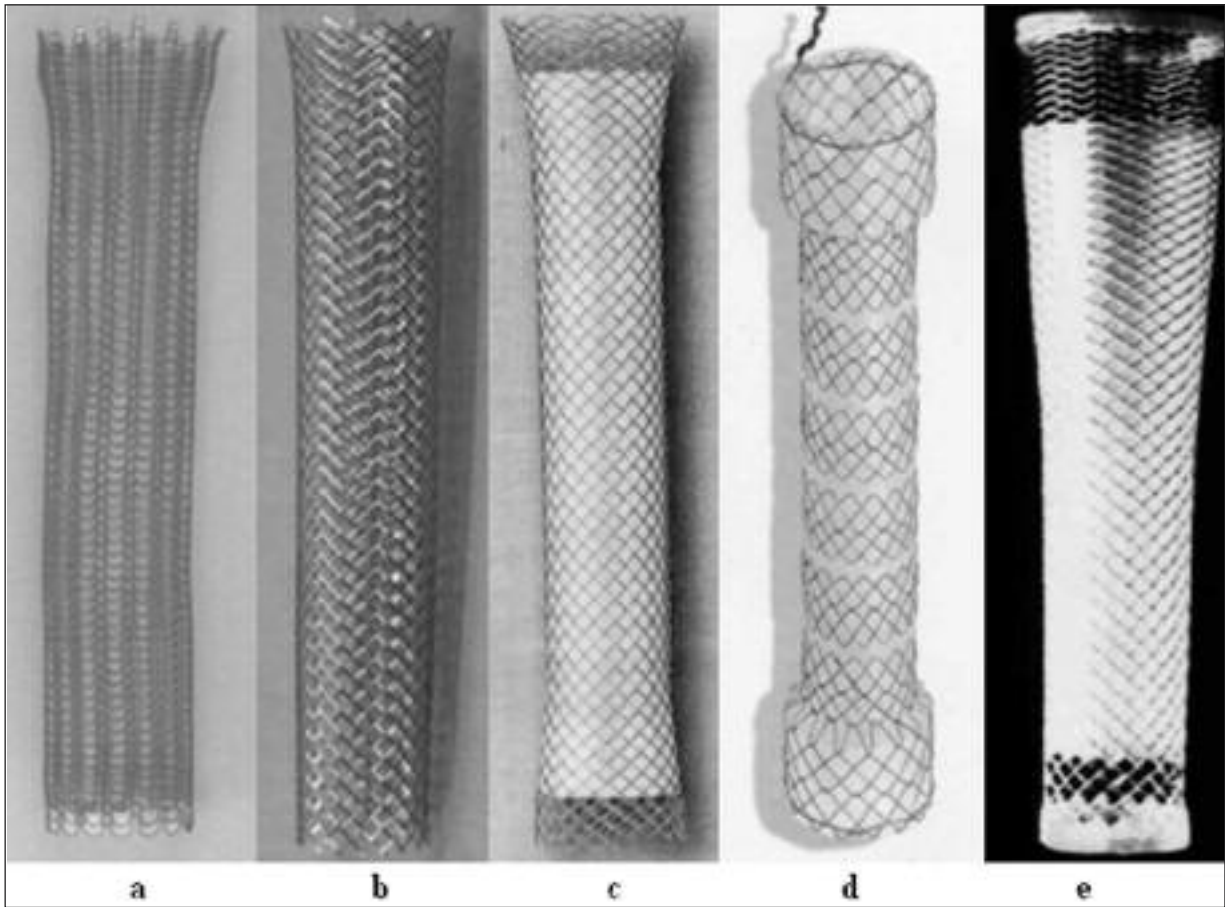


FIGURE 1: Stent types (a) Strecker stent (b) Wallstent (c) Covered Wallstent (d) Choostent (e) Flamingo Wallstent.

Twelve of the stents (6.1%) were Song Stent, stair type (Sohoo Meditech, Seoul, Korea) which is made up of stainless steel with a polyurethane covering.

Nine of the stents (4.6%) were Flamingo Wallstent (Boston Scientific). This is a conical stent made up of a braided stainless steel alloy and is lined with polyurethane.

INSERTION TECHNIQUE

Patients were maintained in left anterior oblique or supine position, and the procedure was performed under fluoroscopic guidance. The pharynx was anesthetized with lidocaine spray. Intravenous sedation was performed when necessary. A 5-F catheter was introduced perorally via an exchange hydrophilic guidewire of 0.035 inch diameter (Radiofocus, Terumo, Tokyo) and was inserted until the level of the lesion. A radioopaque ruler was pla-

ced on the skin and non-ionic contrast medium was injected through the catheter to determine the proximal and distal borders of the lesion. After the catheter and the guide-wire were inserted through the stricture, a 260-cm long stiff guidewire was advanced and the catheter was withdrawn. The stent was placed via the stiff guidewire preferably covering the stricture with its central part and maintaining a 4-5 cm extra length compared to the length of the stricture. Esophagography was performed right after the procedure to check the location of the stent and the free flow of diluted barium solution through the lumen.

AFTERCARE AND FOLLOW-UP

Patients were allowed to start oral fluids in the first 24 hours after the procedure. Afterwards, they progressed gradually to low-residue diet and to more solid food. They were informed to avoid large

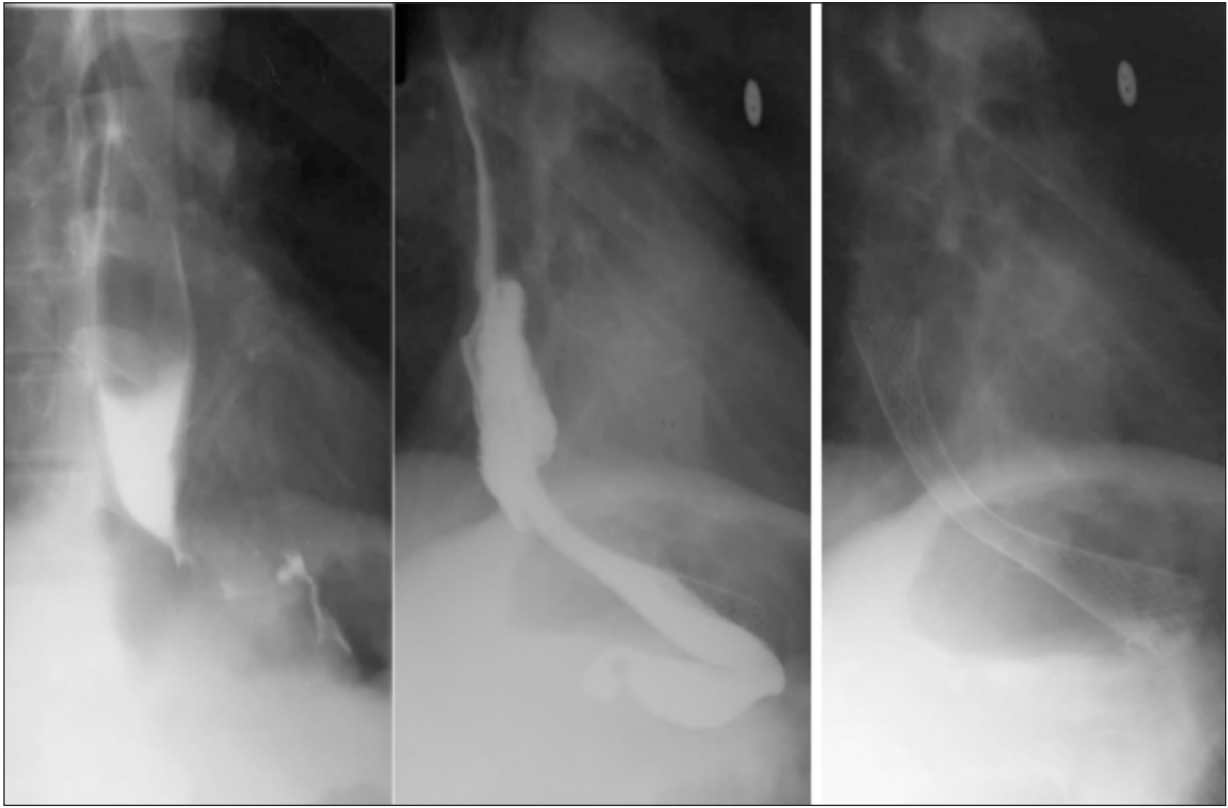


FIGURE 2: 51 year-old female patient with adeno cancer (a) Barium study of the 5 cm stricture in the distal end of esophagus and cardia (b) Barium study during the placement of an uncovered Wallstent (c) Esophagography taken after the placement of the stent.

lumps of food, chew thoroughly and have carbonated beverages during and after the meals to help clear the stent off food particles. Patients whose stents were placed at the gastroesophageal junction were advised to have small and frequent meals, not to lie down at least 1 hour after the meal and benefit from proton pump inhibitors (omeprazole) for the prevention of reflux.

The location, expansion and patency of the stents were evaluated by the esophagographies obtained immediately after the placement of the stent, 24 hours after the procedure and one month afterwards.

Dysphagia score of the patients were reevaluated 24 hours after the procedure and one month afterwards.

In the following year, follow-up was made by monthly esophagographies and endoscopy as long as the general condition of the patients allowed.

RESULTS

The stent insertion technique was successful in all cases. The mean survival time was 3.3 months after the placement of the stent. The maximum survival time was 14 months. The minimum survival time was three days in the patient whose stent was placed due to fistula and mediastinitis.

The average dysphagia score decreased from 3.1 (difficulty in swallowing liquids and saliva) to 1.2 (ability to swallow semi-solids and liquids) providing a 1.9 improvement in the dysphagia score.

In the follow-up period some complications were detected in the patients who received esophageal stents.

Misplacement of the stent was seen in four patients (2.6%). It occurred in one Strecker stent, onecovered Wallstent and in two Choostents.

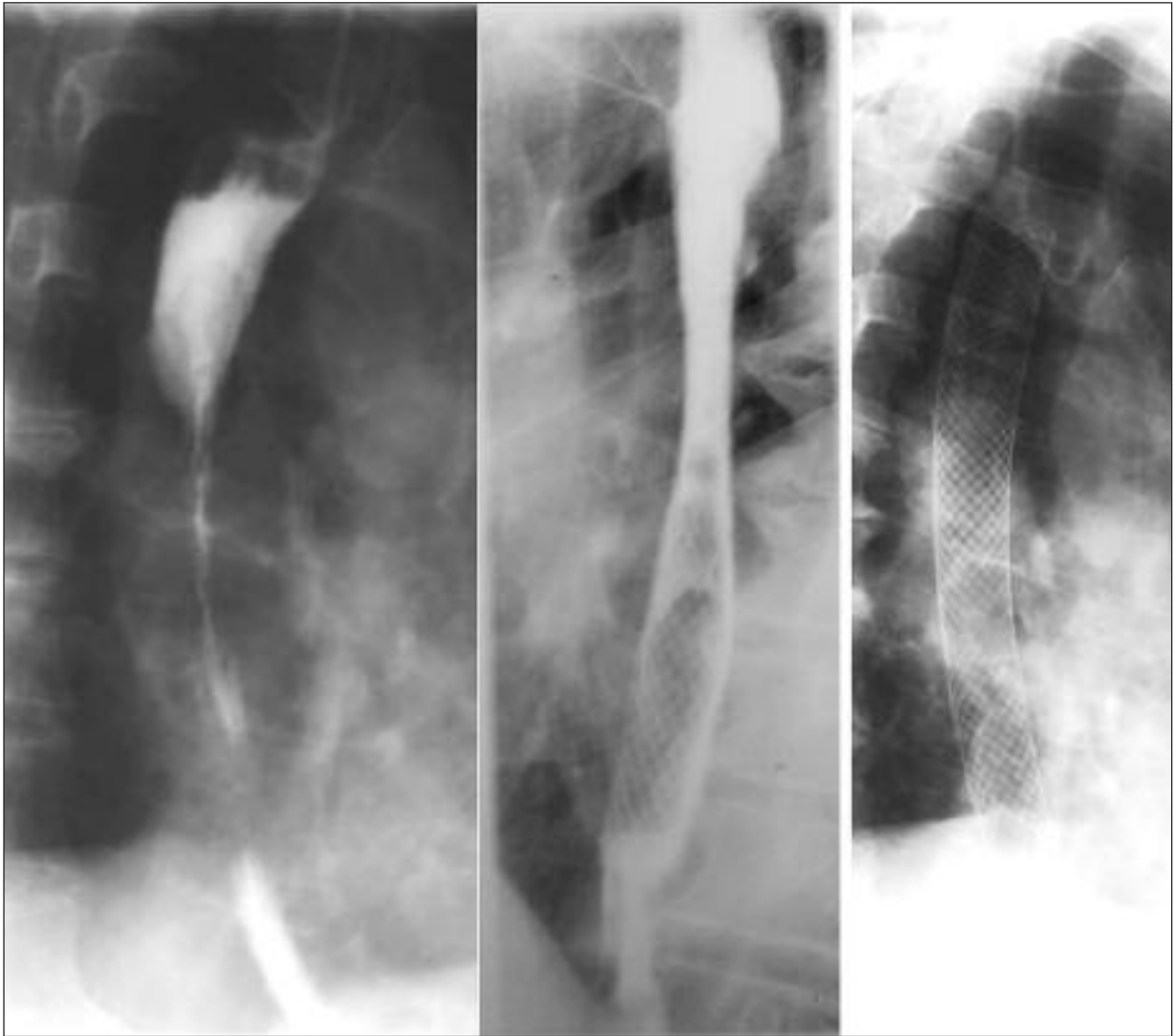


FIGURE 3: 70-year-old male patient with squamous cell cancer (a) Barium study of the 6 cm stricture located in the mid-esophagus (b) Barium study during the placement of an uncovered Wallstent (c) Esophagography after the stent placement.

Early migration was seen in four patients (2.6%). It was observed with two Strecker stents and two covered Wallstents.

Late migration was seen in two patients (1.3%). One of the stents used was an uncovered Wallstent and the other one was a Song stent.

Ingrowth was seen in 12 patients (7.7%). It was seen with six Strecker stents and six uncovered Wallstents (Figure 6).

Overgrowth was seen in seven patients (4.5%). It occurred in four covered Wallstents and three Choo stents.

Coexistence of ingrowth and overgrowth was seen in four patients (2.6%). It was observed with one Strecker stent and three uncovered Wallstents (Figure 7).

Esophago-bronchial fistula was seen in two Strecker stents and in one uncovered Wallstent which makes a total of three patients (1.9%).

Bleeding was seen in one Strecker stent and in one uncovered Wallstent making a total of two patients (1.3%).

DISCUSSION

Esophageal cancer has a poor outcome, with an overall 5-year survival rate less than 10%. Altho-



FIGURE 4: 63-year-old male patient with squamous cell cancer (a) Barium study of the 8 cm stricture caused by squamous cell carcinoma located in the mid-esophagus (b) Esophagography after the placement of a Choo stent.

ugh surgery can be an effective treatment modality,⁶ the diagnosis is usually not made before the disease reaches an unresectable stage. Dysphagia is by far the most frequent symptom. In this patient group, palliative recanalization of the esophagus is necessary to maintain oral intake, minimize hospital stay, relieve of the pain, eliminate of reflux and regurgitation, and prevent aspiration. A number of non-surgical palliative techniques are available to recanalize malignant obstruction, but the use of self-expandable metallic stents provides the most rapid relief of symptoms. Other therapeutic modalities include photodynamic therapy, laser therapy, argon beam, bipolar electrocoagulation, ethanol injection, radiotherapy, chemotherapy and brachytherapy. Although the initial costs of metallic stents are high, the overall costs are advantageous compared to other modalities which often require multiple procedures with repeated inpatient hospitalization.^{7,8}

Stent placement under fluoroscopy guidance is a well established procedure which has a success rate close to 100%.⁴ An improvement in the dysphagia score of at least one grade is noted in 92% to 98% of patients.⁸⁻¹¹ Mean survival time following stent placement is reported between 2.6 and 5.6 months.^{12,13}

There are no absolute contraindications for esophageal stent placement. Relative contraindications are abnormal coagulation profile (INR > 1.5 and platelets < 50.000) and recent high dose of chemotherapy/radiotherapy (3-6 weeks) which increase the risk of hemorrhage and perforation, severely ill patients with limited life expectancy, obstructive lesion of the stomach and/or of the small bowel due to peritoneal seeding, severe tracheal compression that would be made worse by esophageal intubation and extremely high stenoses close to vocal cords.¹⁴

The critical step is to choose the ideal stent for each case to reduce the complications. Procedural complications include perforation, aspiration, hemorrhage, stent migration and pain. Postprocedural complications are perforation, hemorrhage,



FIGURE 5: 67-year-old male patient with squamous cell cancer (a) Barium study of the 12 cm stricture located in the proximal esophagus (b) Barium study done after the placement of a Choo stent.

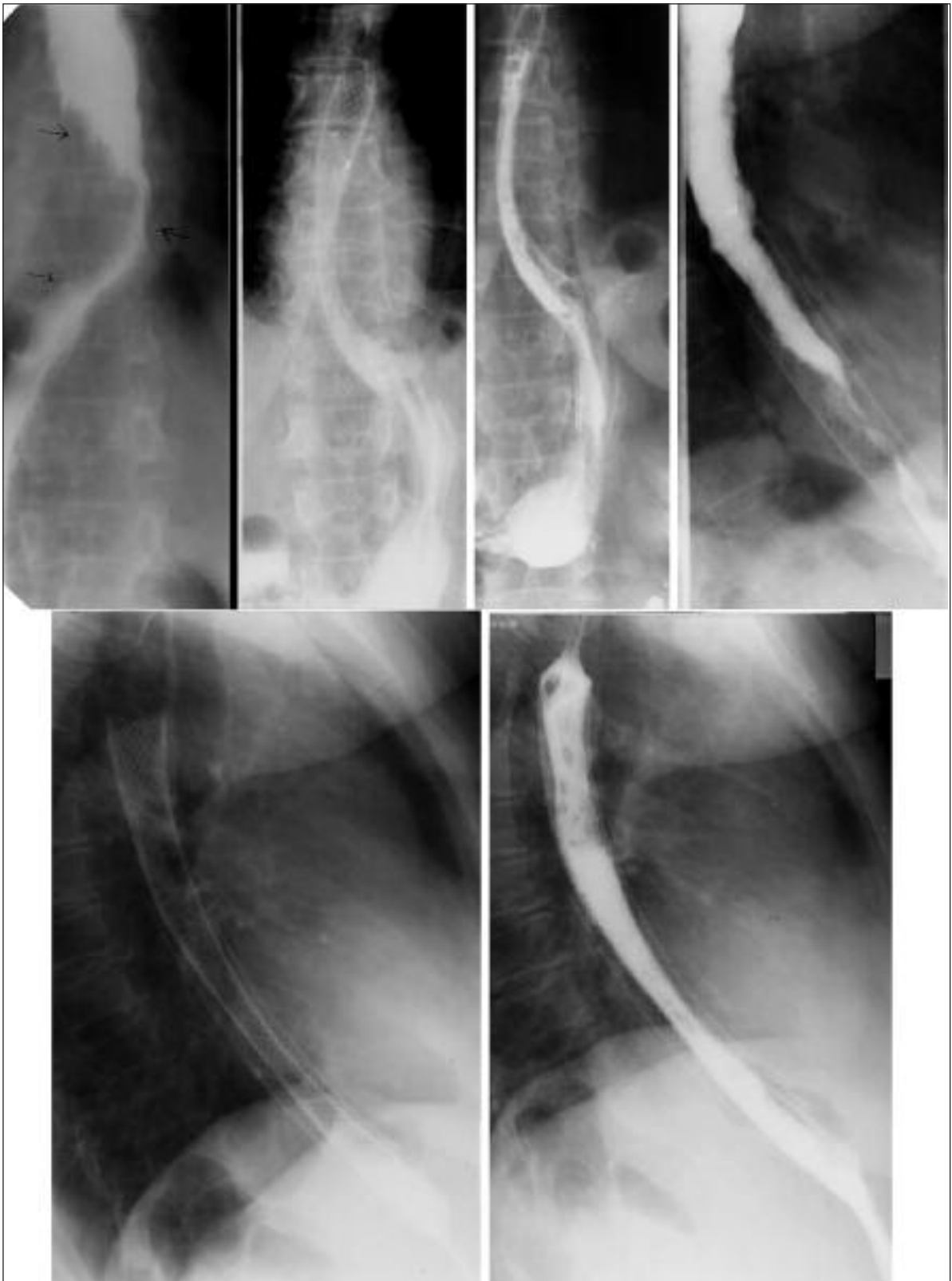


FIGURE 6: 67 year-old female patient with squamous cell cancer (a) Barium study of the 7 cm stricture located in the mid-esophagus (b, c) Barium study after placement of an uncovered Wallstent (d) Barium study in the third month after stent placement indicating ingrowth (e, f) Esophagography and barium study after the placement of a second Wallstent which is covered.



FIGURE 7: 59-year-old male patient with adeno cancer (a) Barium study done six months after the placement of an uncovered Wallstent in the stricture located in the distal esophagus and cardia. Ingrowth and overgrowth are observed (b) Barium study done after the placement of a second Wallstent which is covered.

stent migration, pain, sensation of a foreign body, tumor ingrowth/overgrowth, stent occlusion due to a bolus of food, reflux, esophagitis, mucous membrane ulceration, fever, fistula development and sepsis. The main factors in determining the stent type are the characteristics and the location of the stricture.

The ideal stent resists migration and tumor ingrowth. Tumor ingrowth has been reported very rare with covered stents^{11,15} but 17% to 36% with uncovered stents.^{10,17} Stent migration is more common when covered stents are used especially for the lesions of the gastroesophageal junction. The incidence of stent migration for the uncovered stent is low (0% to 3%), rising to 6% for stents located at the cardia.^{11,15} The incidence of stent migration is reported to be 25% to 32% for covered stents especially placed across cardia.^{11,18} Hemorrhage is reported between 3% and 8% and is usually self-limiting.^{10,11}

Our results are in agreement with the literature. From a critical point of view, we should have

used covered stents in the first place for the cases where ingrowth was observed as a complication. The reason we had used uncovered stents was to prevent migration. For the cases where overgrowth was observed as a complication we should have used longer stents.

In our clinic we preferred to use more flexible stents such as Strecker stent or Choo stent for the lesions located in the proximal esophagus. Because nitinol, which is a titanium-nickel alloy, may help to reduce the troublesome foreign body sensation and tracheal compression. For the hard lesions located in the middle part of the esophagus we used Wallstent or Song stent which are made of stainless steel. For the lesions located in distal esophagus and across the cardia we preferred to use Flamingo Wallstent since its conical shape helps to prevent distal migration. However the immediate availability effected our stent selection.

In this study, no complications were found with the use of Flamingo Wallstent. Flamingo Wallstent reduces the risk of tumor ingrowth since it is a covered stent. To prevent the risk of migration which can be seen with the use of covered stents, it has uncovered segments on both ends and the braiding angle is larger in the upper part of the stent but smaller in the lower part. The use of Flamingo Wallstent can be suggested for the malignant strictures of the lower esophagus.

For the strictures located at lower esophagus and cardia, stents with antireflux mechanisms should also be preferred since the function of the lower esophageal sphincter is lost in such cases.

Further advances in the metallic stent technology are incorporation of chemotherapeutic agents into esophageal stents as well as the development of retrievable or biodegradable stents.

CONCLUSION

Placement of self-expandable metallic stents in malignant esophagus strictures is an easily applied, well-tolerated, effective method with a low complication rate. It can be considered as a good choice for the management of the patients who have inoperable esophageal strictures. The selection of the ideal stent for each patient is of great importance.

REFERENCES

1. Enzinger PC, Mayer RJ. Medical progress: esophageal cancer. *N Engl J Med* 2003; 349 (23):2241-52.
2. Eickhoff A, Jakobs R, Riemann JF. [Palliative treatment options for esophageal and gastric cancer]. *Internist (Berl)* 2004;45(7):756-68.
3. Frimberger E. Expanding spiral--a new type of prosthesis for the palliative treatment of malignant esophageal stenoses. *Endoscopy* 1983;15(Suppl 1):213-4.
4. Sabharwal T, Morales JP, Salter R, Adam A. Esophageal cancer: self-expanding metallic stents. *Abdom Imaging* 2005;30(4):456-64.
5. Cwikiel W, Stridbeck H, Tranberg KG, von Holstein CS, Hambraeus G, Lillo-Gil R, et al. Malignant esophageal strictures: treatment with a self-expanding nitinol stent. *Radiology* 1993;187(3):661-5.
6. Soykan İ, Bahar K. [Palliative treatment of esophageal cancer]. *Turkiye Klinikleri J Surgery* 2000;5(1):31-2.
7. Nicholson DA, Haycox A, Kay CL, Rate A, Attwood S, Bancewicz J. The cost effectiveness of metal oesophageal stenting in malignant disease compared with conventional therapy. *Clin Radiol* 1999;54(4):212-5.
8. Lee SH. The role of oesophageal stenting in the non-surgical management of oesophageal strictures. *Br J Radiol* 2001;74 (886):891-900.
9. Morgan R, Adam A. Use of metallic stents and balloons in the esophagus and gastrointestinal tract. *J Vasc Interv Radiol* 2001;12(3):283-97.
10. Song HY, Do YS, Han YM, Sung KB, Choi EK, Sohn KH, et al. Covered, expandable esophageal metallic stent tubes: experiences in 119 patients. *Radiology* 1994;193(3):689-95.
11. Cwikiel W, Tranberg KG, Cwikiel M, Lillo-Gil R. Malignant dysphagia: palliation with esophageal stents--long-term results in 100 patients. *Radiology* 1998;207(2):513-8.
12. De Palma GD, di Matteo E, Romano G, Fimmano A, Rondinone G, Catanzano C. Plastic prosthesis versus expandable metal stents for palliation of inoperable esophageal thoracic carcinoma: a controlled prospective study. *Gastrointest Endosc* 1996;43(5):478-82.
13. Königsrainer A, Riedmann B, De Vries A, Ofner D, Spechtenhauser B, Aigner F, et al. Expandable metal stents versus laser combined with radiotherapy for palliation of unresectable esophageal cancer: a prospective randomized trial. *Hepatogastroenterology* 2000;47(33):724-7.
14. Sabharwal T, Morales JP, Irani FG, Adam A; CIRSE: Cardiovascular and Interventional Radiological Society of Europe. Quality improvement guidelines for placement of esophageal stents. *Cardiovasc Intervent Radiol* 2005;28 (3):284-8.
15. Adam A, Ellul J, Watkinson AF, Tan BS, Morgan RA, Saunders MP, et al. Palliation of inoperable esophageal carcinoma: a prospective randomized trial of laser therapy and stent placement. *Radiology* 1997;202 (2):344-8.
16. Winkelbauer FW, Schöfl R, Niederle B, Wildling R, Thurnher S, Lammer J. Palliative treatment of obstructing esophageal cancer with nitinol stents: value, safety, and long-term results. *AJR Am J Roentgenol* 1996;166(1):79-84.
17. Acunaş B, Rozanes İ, Akpınar S, Tunacı A, Tunacı M, Acunaş G. Palliation of malignant esophageal strictures with self-expanding nitinol stents: drawbacks and complications. *Radiology* 1996;199(3):648-52.
18. Köcher M, Dlouhy M, Neoral C, Buriankova E, Gryga A, Duda M, et al. Esophageal stent with antireflux valve for tumors involving the cardia: work in progress. *J Vasc Interv Radiol* 1998;9(6):1007-10.