

## CASE REPORTS

# Endoluminal brachytherapy in the treatment of oesophageal cancer. Technique description, case report and review of the literature

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### ABSTRACT

Endoesophageal brachytherapy is a useful technique for the palliative treatment of dysphagia in advanced oesophageal cancer. This technique offers good results on dysphagia control and quality of life. We report the case of a patient treated with this technique presenting complete response to the dysphagia. We describe endoesophageal brachytherapy technique and we comment on the literature.

**Key words:** Palliative endoesophageal brachytherapy. Dysphagia. Oesophageal cancer.

### INTRODUCTION

Oesophageal cancer is an aggressive disease which is usually diagnosed in advanced stages. The prognosis is poor (10-15% survival at 5 years) (1) and dysphagia is a common complication in advanced stages and the quality of life of patients in terminal/advanced phases of this disease is poor when dysphagia is present. Thus, once the diagnosis is made palliation is the primary objective, with various treatment options being available (2). In many cases high-dose rate endoesophageal brachytherapy is one of the best options. This radiotherapy technique involves the introduction of a radioactive source into the applicator through the specific tumour site to be treated. This allows a high dose in the endoluminal tumour component with little impact on neighbouring healthy tissues (1,3).

### CASE REPORT

The patient was a 62-year-old woman, able to carry out daily life activities autonomously, with no previous medical history of interest.

The patient presented with liquids dysphagia for which a gastroscopy was performed showing a bleeding poly-

loid tumor in the middle third of the oesophagus. The tumour was 25 cm from the teeth affecting 45 degrees of the oesophageal wall and the cardias was not affected. Squamous carcinoma was diagnosed by pathological analysis of the tumour biopsy. A oesophagogram (Fig. 1)

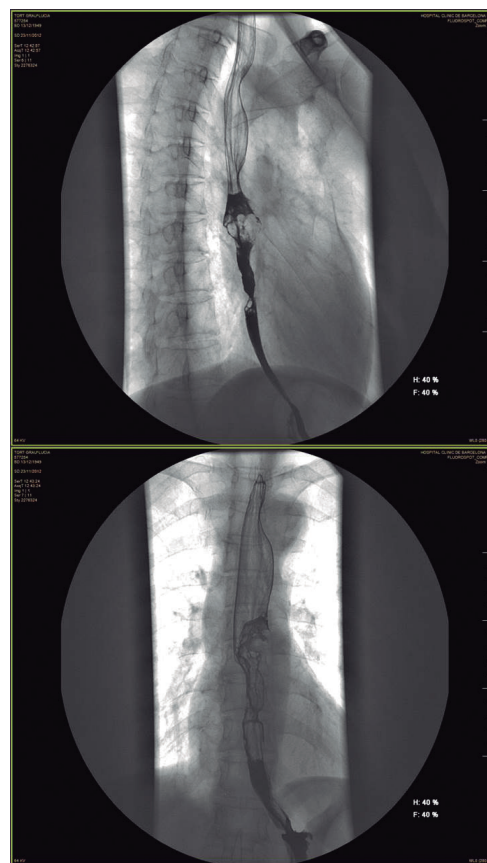


Fig. 1. Oesophagogram with barium contrast showing tumoural stenosis in the oesophageal middle third with proximal dilatation.

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showed a tumour in the middle third of the oesophagus and a wide upper oesophageal dilatation above the tumour. Oesophageal ultrasonography showed a tumour affecting the adventitia. Computed thoracoabdominal tomography (CT) revealed a node in the mediastinum and hepatic and lung metastases.

The patient was staged as T3N1M1 and started chemotherapy based on cisplatin and 5-fluouracil, with partial response of the oesophageal tumour and pulmonary and hepatic metastases after 3 cycles. After completing 6 cycles progression of oesophageal and lung tumour metastases was observed with stabilization of the remaining hepatic metastases.

Thereafter, the patient presented important liquids dysphagia and vomiting after feeding due to stenosis leading to weight loss of 3 kg. Her performance state was 0 and she was considered to receive endoesophageal brachytherapy.

Before brachytherapy, CT (Fig. 2) and ultrasonography were performed in order to determine the size and tumour characteristics and the possibility of oesophageal fistula that could contraindicate the procedure. Following the rules of the American Brachytherapy Society (ABS) (4) a total of 18 Gy in 3 fractions at 6 Gy per fraction were considered as treatment.

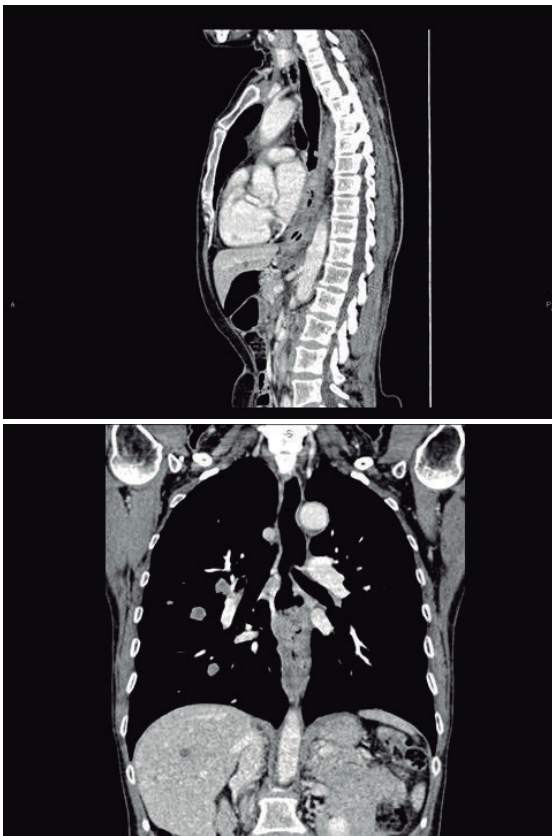


Fig. 2. Sagittal and coronal CT reconstruction showing a concentric thickening of the oesophageal wall from the carina to the gastroesophageal junction. Multiple bilateral lung and hepatic metastases.

The procedure of each treatment was as follows:

1. *Oesophageal gastroscopy* was performed under sedation for *applicator placement* in the Endoscopy Unit at our hospital. A circumferential stenotic tumour was detected at 24 cm to 33 cm from the teeth hindering the passage of a 10 mm gastroscopy tube (Fig. 3A). During the gastroscopy an Amplatz flexible metallic guide was introduced and the gastroscopy was then removed maintaining the position of the guide. Using this guide a 10 mm in diameter Bonvoisin brachytherapy applicator (Nucletron®) was introduced with the following characteristics: a) A central lumen to allow its passage through the metallic guide into the oesophagus and also the introduction of a radioactive source for treatment once the brachytherapy dosimetric study had been performed; and b) marks on its surface every 10 mm to allow the applicator to remain in a determined position in

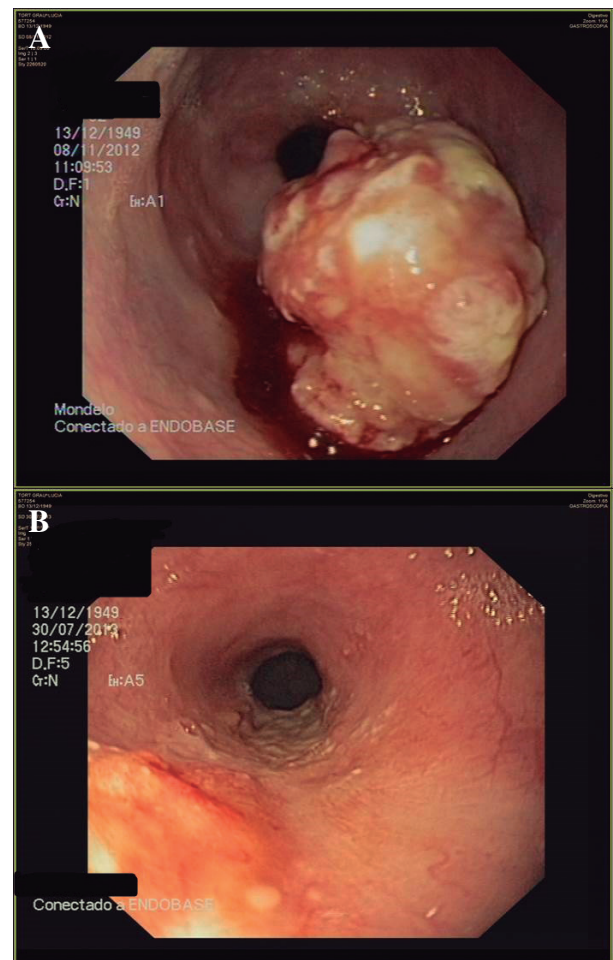


Fig. 3. A. Gastroscopy before treatment: Bleeding polypoid tumour affecting 45 degrees of the oesophageal wall. B. Gastroscopy after treatment: Disappearance of oesophageal tumour. Scar area at 8 hours.

relation to the teeth to treat the tumour with a safety margin (Fig. 4A). Finally, the applicator was fixed to the face skin at an appropriate distance from the teeth.

2. *Treatment planning.* The patient was referred to the Radiation Oncology Department where the correct placement of the applicator was confirmed in relation to the teeth. A radiolucent dummy source with marks every 10 mm was introduced into a transference tube inside the applicator. A 1 mm slice CT was obtained for brachytherapy treatment planning with the patient in the same position as during the gastroscopy procedure. Images were transferred to the planning system (Oncentra Braqui v. 4.1, Nucletron-Elekta®). The tumour to be treated and the organs at risk such as vessels, heart and spinal cord were defined in each CT slice. In this case the bronchi were far from the applicator and were therefore not included in the study. A dosimetric study was performed to administer 6 Gy 5 mm from the applicator surface in each of the 3 treatments with an active source length of 11 cm (Fig. 4B).

3. *Treatment.* The patient was transferred to a radio-protected room where after removal of the dummy source the transference tube was connected to a source transference machine (microHDR, Nucletron®) to undergo treatment with a high-dose-rate (HDR) 192-Iridium source. After confirmation of the correct position of the applicator the treatment was started inside the radioprotected room. During the 10 minutes of treatment the patient was monitored with external TV and radiophonic systems. On completion of the treatment the transference tube and applicator were uneventfully removed and the patient was discharged 3 hours later. The remaining 2 treatments were performed on a weekly interval basis as previously described.

*Evolution:* Following the second treatment the patient reported an improvement in the dysphagia which completely disappeared at 4 weeks after the initiation of treatment. Since then she has followed a normal diet with a progressive increase in weight of 6 kg. Treatment response was evaluated by clinical manifestations and the use of gastroscopy (Fig. 3B), with endoesophageal ultrasonography and chest CT scan also being performed.

After brachytherapy the patient received second line chemotherapy (docetaxel 75 mg/m<sup>2</sup> weekly) with progression of metastases after 3 cycles. At four months after brachytherapy the patient died due to a sepsis and was free of dysphagia.

## DISCUSSION

Endoesophageal brachytherapy was first described in 1909 by Barçat and Guisez using radium candles (5), and

in 1976 the first series using a HDR 192-Iridium source (6) was described in the literature. Despite the technique is not new and different studies have shown its efficacy in pal-

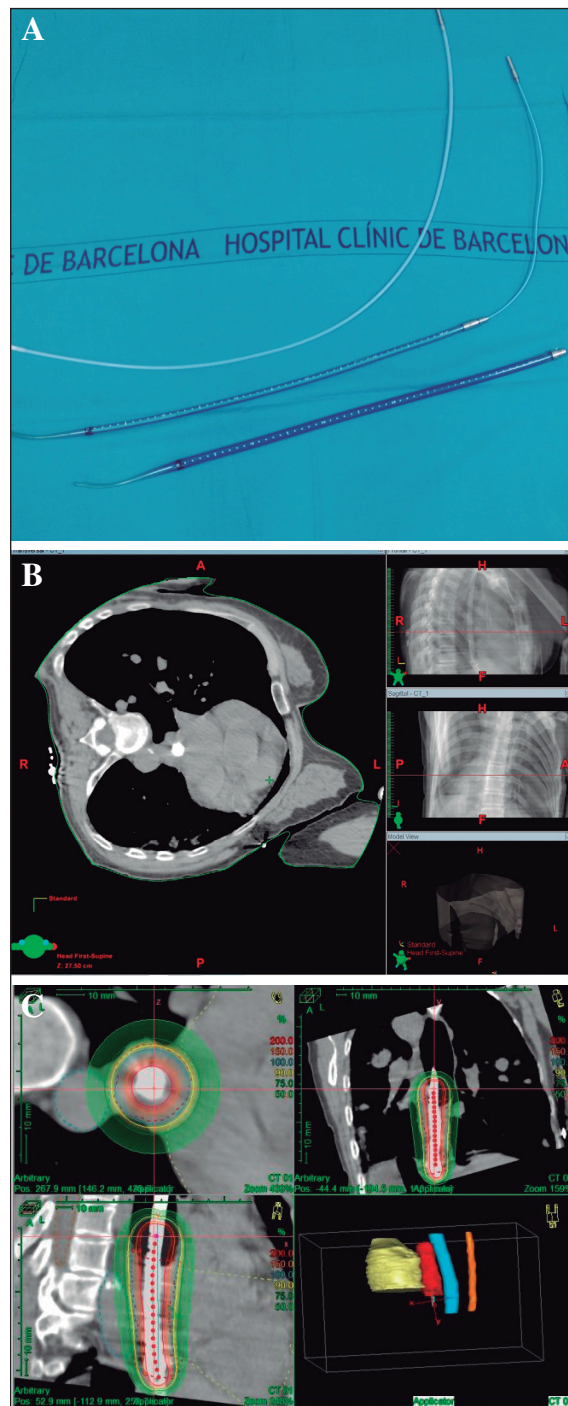


Fig. 4. A. Bonvoisin endoesophageal applicator of 10 x 13 mm in diameter. One with a source transference tube inside. B. CT planning with the applicator. C. Dosimetric study showing dose distribution in axial, coronal and sagittal slices showing a D90 isodose involving the tumour (outlined in red). Healthy tissues at risk are excluded from the high dose isodose.



liative oesophageal cancer treatment, its use has not been extended for different reasons: The lack of HDR source projectors in most centres, the lack of specific applicators considering their cost and a lack of knowledge of the technique. Moreover, the tendency to use a laser technique, endoesophageal prosthesis or gastrostomy in the treatment of dysphagia has made its use less extensive. The low number of patients, their low life expectancy, the fear of complications due to the technique despite being less frequent than in other palliative techniques have also contributed to its lesser use.

Palliative oesophageal cancer treatment of dysphagia can be done with oesophagectomy or oesophageal by-pass; nevertheless, although the palliation is successful, the mortality and morbidity are high. Less aggressive options such as gastrostomy impede oral intake, and prostheses and dilations are not without complications (2). Laser and photodynamic treatments require hospitalisation and induce problems related to sun exposure. External beam irradiation (EBI) needs high radiation doses with the consequent daily attendance to the hospital and has complications including dysphagia and mucositis. All these techniques are effective considering the life expectancy, dysphagia free-interval, treatment related complications and quality of life if applied to the appropriate patient.

Endoesophageal brachytherapy is a rapid effective technique in controlling dysphagia and hematemesis, treating the endoluminal tumour component with low doses to the neighbouring healthy tissues. This treatment can be administered in previously irradiated patients or in those with clinical progression after a prosthesis and laser treatment (7-9). The indications and contraindications of this technique are presented in table I (3,4).

The use of HDR sources allows the administration of high doses in a short time; the consequence is the need to fractionate the treatment to avoid acute and late complications. The number of fractions for palliative treatments ranges between 1 to 3 fractions with doses of between 4 Gy to 15 Gy per fraction depending on the schedule, patient characteristics, life expectancy and the protocol of each centre (10). In general, for palliative treatments doses higher than 18-20 Gy (3 fractions of 6-7Gy) are not rec-

ommended considering that an increased of acute and late complications has been described (4). In the present case the good status of the patient led to the administration of 3 fractions of 6 Gy to allow prolonged palliation.

The results on dysphagia palliation in the literature describe responses between 70% and 90%, with dysphagia-free-intervals of 2 to 9 months and a mean survival of 4 to 14 months (1,3,10,11). In the present case the patient had distant metastases with progression after chemotherapy and died after 4 months free of dysphagia and after having increased her weight by 6 kg.

In a phase III study 219 patients were randomised to receive exclusive EBI (30 Gy in 10 fractions) vs. the same regime plus 2 endoesophageal brachytherapy applications of 8 Gy each. The dysphagia-free interval was superior in the combined brachytherapy treatment with benefits in the degree of dysphagia, regurgitation, chest pain and performance status (absolute benefit of 18%) (9).

We would like to remark another randomised phase III by Homs et al. in which 209 patients were randomised to receive one brachytherapy fraction of 12 Gy vs. stent, to analyse the results in dysphagia, complications, relapses and costs. Dysphagia response was faster with stent, nevertheless after 30 days results on complications and dysphagia-free interval and quality of life were superior for patients treated with brachytherapy; there were no differences in cost and overall survival (12,13). The authors concluded that endoesophageal brachytherapy should be the treatment of choice for dysphagia palliation. This treatment should probably be considered in patients with a good performance status and a life expectancy of greater than 2 months (14). Moreover, brachytherapy treatment does not impede posterior placement of a stent.

Considering the low life expectancy in palliative cases, long term complications should not be expected, with their appearance occurring in long term survivors. The incidence of complications can vary among series and are mainly associated with high doses per fraction and appear after 6 months. The most usual complications are ulcers (3-28%), different degrees of stenosis that may be due to tumour progression or treatment-related fibrosis (2-44%), fistula due to tumour progression in half of the

**Table I. Indications and contraindications in palliative endoesophageal brachytherapy**

<i>Indications</i>	<i>Contraindications</i>
Tumour < 10 cm length	Tumour > 10 cm length
Tumour confined to oesophageal wall	Involvement of superior oesophageal third and cardias
Thoracic oesophagus	No possibility of gastroscopy (stenosis...)
No lymphatic and distant metastasis (optional)	Tracheoesophageal fistula
Life expectancy > 2 months	Extraoesophageal and/or lymph node involvement

cases (2-17%) and haemorrhage (6-8%) (3,10,12,14,15). In any case, a similar incidence of complications is observed after EBI series.

The present case showed complete response of dysphagia, with no treatment-related complications, and the patient was able to return to normal food intake increasing her weight by 6 kg and presenting a good quality of life until she died.

In conclusion, endoesophageal brachytherapy offers clear advantages in the palliative treatment of dysphagia considering its high number of responses. Treatment can be performed on an outpatient basis, and it is well tolerated with a feasible oral intake several hours later. The toxicity is lower than with other treatment modalities and it can be performed before or after other palliative treatments. The impact on the life quality of the patients is clear as demonstrated in the present case and it is cost/effective from the economic point of view. Considering all these aspects endoesophageal brachytherapy should be considered the treatment of choice when indicated.

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