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SOUTTAR TUBES FOR OESOPHAGEAL CARCINOMA

ABSTRACT

In 1954 Mr. Henry Souttar developed a technique for providing temporary stoma formation in cases of oesophageal carcinoma. Since then, tens of thousands of patients have been treated in this manner. The technique was developed by experimentation with various prosthetic materials, and the choice of materials was based on the results obtained in the laboratory and clinical practice. In 1954, Mr. Souttar introduced the technique to the public, and it has been widely adopted ever since.

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ABSTRACT

In 1924 Sir Henry Souttar developed a coiled wire prosthesis for inserting through an oesophageal carcinoma to maintain the lumen. From the engineering viewpoint these are springs made of 1 mm. wire. The inside gives an appearance of a thread with 25 turns per inch. The difference between the internal and external diameter is 2 mm. The Souttar tubes have a proximal lip 2 mm larger than the body. They stay in place because the outside is rough, they are inserted tightly into the stricture, and because of the lip. The wire is either stainless steel, German silver or gold plated. The tubes are made in various sizes; min the largest is 15.0 cm length × 1.4 cm outside diameter × 1.2 cm inside diameter. The advantages of these tubes over Celestine or Mousseau-Barbin tubes are that they can be pulled through a laparotomy incision, reducing mortality and morbidity, avoiding an operation and allowing the patient to leave hospital in a few days. They are flexible and for any given outside diameter have a larger inside diameter than other tubes.

Key words. Souttar tube; oesophageal carcinoma.

INTRODUCTION

There is considerable controversy over the treatment of squamous cell carcinoma of the body of the oesophagus. The majority of patients have unfortunately died by the end of the first year and the number who survive five years is only about 5%. In a disease with such a bad prognosis it is clear that cure is a rare event. Attempts at more major surgery which involves lengthier operations and removal of more tissue in ill patients have not improved the survival rates. The operative mortality for operations on the mid and upper oesophagus still lies between 15 and 40% in published cases.
Radiotherapy, on the other hand, has almost no mortality, but does not always produce permanent relief of obstruction to swallowing. The major problem that persists with both surgery and radiotherapy is difficulty in swallowing; if the disease process cannot be completely eradicated the doctor should concentrate on the relief of the main symptom, namely dysphagia. The insertion of palliative intubation tubes is therefore important in the treatment of carcinoma of the oesophagus. In general terms the two types of tubes that are inserted can be divided into those which are pushed through the obstruction and those which are pulled through. The latter involves making an opening either in the oesophagus through a thoracotomy or in the stomach through a laparotomy. The hospital mortality for these procedures is considerable and in some cases has reached 30%. On the other hand, if a tube can be pushed through from above, the patient will be able to leave hospital without having had either a thoracotomy or a laparotomy and will be able to swallow. The push technique is technically difficult, and requires more expertise than the pull method of intubation.

HISTORICAL

The push type of tube is based on either the coiled spring or a rigid plastic tube. The pull type of intubation tube most commonly used is either a Mousseau-Barbin tube made of Neoplex plastic or a Celestin tube made of latex rubber.

Historically the first successful intubation was reported by Sir Charles Symonds in 1885 (Symonds, 1885). Originally a boxwood funnel was used but later this was changed to ivory, silver or gum elastic. It was Sir Henry Souttar in 1924 (Souttar, 1924) who first developed a method which was more reliable than those previously utilised. Souttar had studied engineering at Oxford before he took up medicine at the London Hospital and was fully aware of the properties of a spring. He developed a coiled spring which was rigid enough to be pushed down the oesophagus but which itself could bend, elongate and did not collapse (Fig. 1). His tubes were originally made of German silver and then coated with...
gold to prevent them from tarnishing. The internal diameter was 10 mm or less and there was a lip at the proximal end, which together with the rough outer surface of the spring prevented the tube falling through. Only later did he have a secondary spiral on the shaft of the spring (Souttar, 1927).

The next major advance was the introduction of the Mousseau-Barbin tube made of Neoplex plastic (Mousseau et al., 1956). These tubes were larger, had a greatly expanded proximal funnel and there was a long thin introducing portion. They relied entirely on a large lip to stop them falling through the obstruction. The excessive length was cut off once the tube had been placed in the correct position. In 1959 Celestin modified this tube (Celestin, 1959). Originally his was also made of plastic, but later he used the modern technology of enmeshing a nylon spiral into latex rubber. His tubes have a separate detachable pilot bougie and the body of the tube contains a radiopaque strip. These tubes have an internal diameter of 10 mm and a wall thickness of 1 mm. They rely on the funnel at the proximal end for fixation since the body of the barrel is smooth.

Other specialists in this field have developed different methods. Palmer has used a polythene tube and shapes each one of them individually before introduction (Palmer, 1973). Mackler and Mayer insert similar polythene tubes through a thoracotomy incision, having opened the oesophagus (Mackler and Mayer, 1954). The basic principle of all of them is similar in that they depend on the size of the proximal lip to prevent dislodgement. Only the Souttar tube with its irregular outer surface depends on a roughened barrel rather than a very large lip for fixation.

**TECHNIQUE**

The correct assessment of the patient by radiography is essential. Ideally a film of the total chest during a barium swallow should be done together with markers of a known size in a similar fashion to that used for radiotherapy. If the patient has swallowed barium and is then tipped into the Trendelenberg position, both ends of the tumor will be visible and its length can be assessed accurately. It is essential to try and use the shortest tube possible because swallowing will be easier than with a long tube. At oesophagoscopy, bougies are passed until the optimum diameter is reached.

The minimal size of tube that should be inserted is 10 mm in diameter, so it is always advisable to try and enlarge the oesophagus to this size even though it may take two or three separate dilatations. If this is impossible because of the danger of perforating the tumour, then a smaller size tube must be inserted. The tubes are made with 1 mm. stainless steel wire so any tube with an internal diameter of 10 mm. has an outer diameter of 12 mm, which is equivalent to 42 French gauge. French gauge is equivalent to the circumference in mm. and it is essential to know the conversion factor from French gauge to the size of tube used. Most bougies are not machined accurately on the basis that TT = 3.142 but on the simple conversion factor of 3 to give the exact diameter. Knowing the size of the bougies and then having experience as to how tight the tumour is or how great the resistance is, the dilatation should proceed. There is only one chance of pushing in the tube and it is essential to have dilated the stricture exactly for any
given sized tube. The outer lip is standardised to 18 mm external diameter so a large oesophagoscope is essential with an internal diameter that can take at least a 54 French gauge bougie. The original Negus oesophagoscope was suitable for this and the new oesophagoscope developed by Earlam is slightly larger.

In the past there has been considerable confusion because the metric system has not been adopted. If French gauge or Charrière (which is synonymous) is used for the size of bougies then inches or fractions thereof must not be used for tubes. English gauge as a measure of bougie size is incomprehensible even to the English and few are aware of the accurate conversion of inches to millimetres. This in itself must have been responsible in the past for many problems in inserting palliative intubation tubes. An additional difficulty has been the lack of standardisation of the material of the bougies. A new set of dilators made of teflon (Fig. 2) fixed to a stainless steel wire shaft and a hexagonal handle carrying the size in French gauge clearly marked have been developed. * Teflon is an ideal material for bougies; it has a very slippery non-stick surface that does not require lubrication, it is flexible in its small diameters and loses none of its properties when heated to 260° centigrade, so it withstands autoclaving. Having standardised the size and the material of the bougies it is then much easier to assess the properties of each obstructive tumour.

Once the tumour has been dilated to a given size and one has knowledge of the resistance and the length of the tumour, the scene is set for insertion of a tube. The introducer rod of 9 mm in diameter is passed well through the obstruction. The correct Souttar tube is placed over it and pushed downwards. If the distal beak of the oesophagoscope rests just above the tumour at the site where the lip will stay in future, the introducer tube enables it to be pushed accurately into its final position. Since everything is done blindly it is essential to have markers on this tube. The first black band shows that the proximal end of the beak has been reached (Fig. 3) and then the first of the handle markings show the distal end (Fig. 4). If it is necessary to push Souttar tube any further, the additional markings on the handle are useful in assessing how far it should be introduced. At the end of the procedure the introducer rod and tube are removed. Finally, the oesophagoscope should be used to see whether the tube is in its correct position and is patent. It is useful to pour fluid down to see that the lumen is open; air insufflation can confirm this. A post-operative chest X-ray is essential to make sure that the tube is in its correct position.

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Fig. 3 - The proximal end of the oesophagoscope showing the white handle of the introducer tube and the black groove.

Fig. 4 - The distal end of the oesophagoscope with the Souttar tube passing over the introducer rod and pushed by the teflon introducer tube.

Fig. 5 - A lateral chest X-Ray showing the Souttar tube in its final position.

and that there has been no leak (Fig. 5). It is extremely difficult to alter the position of a tube once it has been placed in situ.

COMPLICATIONS

One complication is that the tube passes out through the obstruction. The majority will stay in the stomach but smaller ones can pass per rectum. Analysis shows that the tube was in fact inserted prior to a course of radiotherapy and in the majority, when the tumour had shrunk, the lumen enlarged and the tube fell out. Consequently it is not the author's practice to use these tubes as palliation prior to radiotherapy, since swallowing usually improves after one or two weeks. If there is complete obstruction to liquids, palliative feeding with Aminutrin, Vivonex or Clinifeed can be done through a tube with a one millimetre bore. Such small tubes do not upset the patient as much as a larger naso-gastric tube. If these Souttar tubes are inserted after radiotherapy or through an obstruction which is not going to be treated by radiotherapy they very rarely pass into the stomach.

Occasionally a tube may be dislodged upwards. The author has never seen this with a Souttar tube and it is more likely to occur with the pull through method which relies on the lip preventing the tube passing through. Consequently there is nothing to prevent it working its way upwards.

Obstruction can occur with any tube. If 10 mm internal diameter is achieved then the patient should manage normal food provided he chews it well. Bolus obstruction can occur and should be treated initially with enzymes such as chymotrypsin orally. If this fails, a naso-gastric tube may be used to clear the obstruction and only rarely is oesophagoscopy essential.
Pressure from too large a tube may produce necrosis of arteries or a fistula into the trachea or lungs. Frequently, however, these tubes can be inserted in the presence of a pulmonary fistula, block it off and enable the patient to swallow. The danger of pressure from a Souttar tube is probably no greater than that from a Mousseau-Barbin or Celestin tube.

One disadvantage of the Souttar tube occurs if it is used in obstructions of the cardia when an adenocarcinoma of the stomach extends proximally and tumour grows up over the short lip of the spring. It is the author's practice not to use Souttar tubes in obstructive carcinoma of the stomach. It is much wiser to use a Celestin tube which has a larger lip so that, during the remainder of the patient's life, if there is longitudinal spread of the untreated tumour the proximal funnel is not obstructed. In carcinoma of the body of the oesophagus treated by radiotherapy with a subsequent narrowing, the author has never seen the lumen obstructed by further growth.

SUMMARY

The Souttar tube is made of 1 mm stainless steel wire coiled as a spring and is used for palliation in squamous cell carcinoma of the body of the oesophagus, ideally when there is patent normal oesophagus below the tumour. Insertion of these tubes is difficult but the technique is well worth learning since the patient avoids an operation which itself has a mortality when the pull through method of intubation is used. Palliative intubation will enable the patient to swallow following radiotherapy. The patients are unaware that the tube is in place and normal food can be swallowed if it is chewed well.

REFERENCES