The Journal of Laryngology and Otology
July 1997, Vol. **111**, pp. 627–630

Endoscopic laser myotomy in the treatment of pharyngeal diverticula

R. A. BRADWELL, F.R.C.S.*, A. K. BIEGER, M.D., F.R.C.S. (GLAS.)†, D. R. STRACHAN, F.R.C.S.†, J. J. HOMER, F.R.C.S.†

Abstract

The endoscopic approach is a simple and cost-effective option in the treatment of hypopharyngeal diverticula. Whereas almost a third of all endoscopic myotomies performed by UK otolaryngologists are carried out with the stapling technique, CO_2 laser diverticulotomy has not been given as much consideration (Koay *et al.*, in press).

We report on the first British series of 15 patients treated between 1985 and 1993 with microscopic laser diverticulotomy. The follow-up period was four to 11 years. Complications occurred in three patients, two patients required a repeat myotomy and 11 patients have been satisfied with their swallow since the operation.

Our results are similar to those of larger studies. The laser technique is more established than the stapling gun myotomy and it has the advantage of superior visualization. It may also be used in small pouches which do not admit the insertion of a stapling gun.

Key words: Laser surgery; Hypopharynx diverticula

Introduction

It is widely accepted that the optimal treatment for progressive dysphagia due to a hypopharyngeal diverticulum is surgical excision. This is despite the fact that over thirty years ago Dohlman and Mattsson (1960), re-describing a technique first reported by Mosher in 1917, presented the results of 100 cases of hypopharyngeal diverticula satisfactorily treated endoscopically. The technique involved the use of a double-lipped speculum allowing electrocautery to the septum dividing the pouch and the oesophageal lumen. Dohlman's successful results have since been reproduced in a large series by Holinger and van Overbeek (Holinger and Jensik, 1973; van Overbeek and Hoeksema, 1982).

Over the past 10 to 15 years the endoscopic technique has been refined in some centres by the successful use of a CO_2 laser to divide the muscular septum (Hoeksema *et al.*, 1985; Knegt *et al.*, 1985; Holinger and Benjamin, 1987; Benjamin and Gallagher, 1993). The largest series, reported by van Overbeek, has shown a lower incidence of complications using the laser rather than electrocautery (van Overbeek, 1994).

In 1993 the endoscopic stapling diverticulotomy was simultaneously introduced by Martin-Hirsch and Newbegin (1993) in the UK and Collard *et al.* in Belgium (1993). It has been suggested that by stapling the muscular septum a good seal is obtained preventing mediastinal leakage, haemostasis is achieved and thermal injury to the recurrent laryngeal nerve avoided (Bates and Koay, 1996). However, visualization may be poor even with a Hopkins lateral telescope to check the position of the gun. It may not be suitable for a small pouch and a forcefully inserted gun may even cause a perforation at the bottom of the diverticulum. The results of this technique are so far reported only in a small series with a short follow-up period (Collard *et al.*, 1993; Fremling *et al.*, 1995; Koay and Bates, 1996; Scher and Richtsmeier, 1996).

In reviewing our results with laser myotomy we hoped to address the question how our results would compare to those of larger studies from abroad and whether laser myotomy may still be a safe alternative to the stapling gun technique and thus merit its place in pouch treatment. We retrospectively reviewed our 11 years experience of microscopic laser diverticulotomies on 15 patients with particular emphasis on complications encountered and evaluated patient satisfaction post-operatively and long-term by a questionnaire.

Patients and methods

The study consisted of a retrospective review of 15 patients who had undergone endoscopic laser treat-

From the Departments of Otorhinolaryngology, Harrogate District Hospital*, and Bradford Royal Infirmary†, Bradford, UK.
Accepted for publication: 14 May 1997.

ment for a pharyngeal diverticulum between 1985 and 1993 and a patient questionnaire. All patients had the diagnosis established pre-operatively by barium swallow radiography with three patients also showing evidence of a co-existing hiatus hernia one of whom had an associated stricture. The sex distribution was even (males:females = 7:8) and the age range was from 49 to 87 years with an average age of 69 years.

In all cases the endoscopy was performed under general anaesthesia and initially involved the demonstration of the pouch and the exclusion of any signs of malignancy. One potential laser diverticulotomy was abandoned at this point due to a probable perforation of the pharyngeal wall, there were however no post-operative problems in this case and the patient was treated successfully at a later date.

After insertion of a Storz diverticuloscope the muscular bridge between the pouch and oesophagus was identified using the operating microscope with a 400 mm lens. This bridge was then carefully divided using a continuous cutting CO_2-laser beam at 15–20 watt power. A nasogastric tube was not routinely inserted but each patient was maintained on intravenous fluids and closely monitored post-operatively. Oral fluids were commenced within 24 hours of surgery following a satisfactory clinical examination of the neck and post-operative chest X-ray.

The length of stay in hospital was calculated and any post-operative complications noted. Finally a letter was sent to each patient asking them to answer six questions relating to their symptoms since surgery (Table I) and also asked for any further comments regarding their treatment. All 15 patients responded to the questionnaire.

Results

Three patients suffered complications recorded in the case notes. The most significant was one case of oesophageal perforation which required transfer to a cardiothoracic unit but following initial oesophagoscopy ultimately settled with conservative management, although some long-standing swallowing problems persist. Asymptomatic surgical emphysema was demonstrable in one patient and required a prolonged hospital admission (11 days) whilst troublesome haemorrhage requiring electrocautery and transfusion occurred in one other patient. Both patients made full recoveries.

The follow-up period varied from four to 11 years and revealed that two patients required further surgery for swallowing problems. This took the form of a repeat laser diverticulotomy and produced no further complications and a satisfactory outcome.

The length of hospital stay required for each operation varied between two and 11 days with an average hospital stay (excluding the one patient transferred to another unit) of less than five days.

The results of the questionnaire are summarized in Table I. The large majority of patients (11 of the 15) felt their swallowing had been entirely comfortable since the operation. Only one patient had problems maintaining his weight, although he was satisfied with the operation. No voice problems had been encountered. Four patients were not entirely satisfied with the results of the treatment. Two of these had significant dysphagia – one patient who had the above mentioned complication of a perforation, the other whose pre-operative barium swallow showed a hiatus hernia and a stricture as well as the pharyngeal pouch. The other two not entirely satisfied patients had a co-existing hiatus hernia.

TABLE I
QUESTIONS AND RESPONSES OF EACH PATIENT

Question	Response	
1. Has your swallowing been entirely comfortable since your operation?	Yes 11	No 4
2. Are you apprehensive of eating and swallowing?	No 12	Occasionally 3
3. Has your weight remained steady or increased	Yes 14	No 1
4. Has your weight gone down so that you had to make an effort to keep it up?	No 14	Yes 1
5. Has your voice bothered you?	No 15	Yes 0
6. Do you still bring back food you have tried to swallow?	No 14	Yes 1

Discussion

Surgical treatment of a pharyngeal pouch is far from 'routine surgery' with a recent authoritative text suggesting a major complication rate, following pouch excision, of at least one third (Maran *et al.*, 1993). An endoscopic approach is simpler and less time-consuming, however, the risk of major complications persists with quoted rates of between 10 and 31 per cent (Maran *et al.*, 1986; Wouters and Overbeek, 1990). The results in our series are in keeping with the experiences of other centres. The results of the stapling gun myotomy have so far only been reported in four small studies: three series with six patients each (Collard *et al.*, 1993; Fremling *et al.*, 1995; Scher and Richtsmeier, 1996) and one study with 14 patients (Koay and Bates, 1996) with a short follow-up period. Apart from one non-serious complication in one study (Collard *et al.*, 1993) no complications were encountered.

The use of a laser rather than electrocautery has in some studies led to a reduction in the complication rate. It is felt that better visualization using the operating microscope leads to a more accurate incision. Van Overbeek points out that, due to the poor coagulation properties of the CO_2 laser, bleeding may necessitate per-operative electrocoagulation using insulated microsurgical forceps or a suction tube (van Overbeek, 1994). Recent suggestions to reduce the complications following endoscopic diverticulotomy have included carrying out digitalized subtraction angiography of the aortic arch prior to surgery to ascertain the vascularity of

the septum, the application of fibrin glue as a sealant and the use of a KTP/532 laser for the diverticulotomy (Weerda *et al.*, 1989; Kuhn and Bent, 1992). Although the cost of acquiring laser equipment is high, its availability is becoming more widespread.

In considering the cost-effectiveness of treatment of a pharyngeal diverticulum the reduction in time spent as an in-patient is significant. In our series the average stay of 4.5 days compares favourably to that of over two weeks following pouch excision in other UK series (Todd, 1974; Mackay, 1976; Freeland and Bates, 1987). An additional advantage of the endoscopic approach is that, requiring a significantly shorter anaesthetic combined with a reduced postoperative rehabilitation period, it is an appropriate form of treatment in older and infirm patients or those with associated medical problems. Indeed, it may be performed under local anaesthetic if necessary (van Overbeek, 1994).

The recurrence rate of pharyngeal diverticulotomy is significant and may occur many years later. The rates of recurrence, well summarized by Parker and Hawthorne (1988), vary considerably from between 10 and 79 per cent for Dohlman's procedures (Dohlman and Mattsson, 1960) to between two and 33 per cent for excision and myotomy in the UK series. Overall there does appear to be a higher rate of recurrences using an endoscopic approach, however we believe that our rate of recurrence (two from 15 patients) is acceptable, particularly as they have been satisfactorily treated by a second endoscopic approach.

The incidence of patient satisfaction following surgery has been specifically looked at in this study. Although van Overbeek reports 99 per cent patient satisfaction in his large series (Wouters and Overbeek, 1990), other series have produced overall patient satisfaction rates closer to our figures of 11 out of 15 (73 per cent). Three of the remaining four patients in our series described some improvement in their swallowing. This is similar to the series of Flikweert and van der Baan (1992) in which 72 per cent were highly satisfied, with a further 20 per cent fairly satisfied, following endoscopic diverticulotomy. This latter paper failed to show a significant difference with respect to patient satisfaction between the use of the CO_2 laser and electrocautery but it is pointed out that the use of the CO_2 laser and operating microscope is a significant technical advance and from our own experience we would support this assertion. In the stapling group one study reported complete resolution of symptoms in all patients (Fremling *et al.*, 1995), another study showed complete resolution of symptoms in five out of six patients (Collard *et al.*, 1993). A third series described a complete resolution of the symptom of regurgitation and the symptom of dysphagia to solids in 12 out of 14 patients (Koay and Bates, 1996).

To clarify which endoscopic technique is superior, larger studies on the stapling technique with a longer follow-up are needed and for a true comparison a randomized trial between the stapling and laser technique would be required. However, even if the excellent initial results of stapling are confirmed by such a trial, there are certain situations such as poor visualization due to the gun within the endoscope or a pouch too small to permit a gun fully, when the laser technique would still be the most appropriate treatment.

References

Bates, G. J., Koay, C. B. (1996) Endoscopic stapling diverticulotomy of pharyngeal pouch. *Annals of the Royal College of Surgeons of England* **78:** 151–153.

Benjamin, B., Gallagher, R. (1993) Microendoscopic laser diverticulotomy for hypopharyngeal diverticulum. *Annals of Otology, Rhinology and Laryngology* **102:** 675–679.

Collard, J. M., Otte, J. B., Kestens, P. J. (1993) Endoscopic stapling technique of esophagodiverticulostomy for Zenker's diverticulum. *Annals of Thoracic Surgery* **56(3):** 573–576.

Dohlman, G., Mattsson, O. (1960) The endoscopic operation for hypopharyngeal diverticula. *Acta Otolaryngologica (Stockholm)* **71:** 744–752.

Flikweert, D.C., van der Baan, S. (1992) Endoscopic treatment of pharyngeal pouches: electrocoagulation vs carbon dioxide (CO_2) laser. *Clinical Otolaryngology* **17:** 122–124.

Freeland, A. P., Bates, G. J. (1987) The surgical treatment of a pharyngeal pouch: inversion or excision? *Annals of the Royal College of Surgeons of England* **69:** 57–58.

Fremling, C., Raivio, M., Karppinen, I. (1995) Endoscopic discision of Zenker's diverticulum. *Annals Chirurgiae et Gynaecologiae* **84(2):** 169–172.

Hoeksema, P. E., Edens, E. T., van Overbeek, J. J. (1985) Microendoscopic surgery of the hypopharyngeal pouch with the CO_2 laser. *Lasers in Surgery and Medicine* **5:** 367–369.

Holinger, P. H., Jensik, R. (1973) Halting the progress of Zenker's diverticula. *Geriatrics* **28:** 133–137.

Holinger, L. D., Benjamin, B. (1987) New endoscope for (laser) endoscopic diverticulotomy. *Annals of Otology, Rhinology and Laryngology* **96:** 658–660.

Knegt, P. P., de Jong, P. C., van der Schans, E. J. (1985) Endoscopic treatment of the hypopharyngeal diverticulum with the CO_2 laser. *Endoscopy* **17:** 205–206.

Koay, C. B., Bates, G. J. (1996) Endoscopic stapling diverticulotomy for pharyngeal pouch. *Clinical Otolaryngology* **21:** 371–376.

Koay, C. B., Sharp, H. R., Bates, G. J. (in press). Current practice in pharyngeal pouch surgery in England and Wales. *Annals of the Royal College of Surgeons of England.*

Kuhn, F. A., Bent, J. P. (1992) Zenker's diverticulotomy using the KTP/532 laser. *Laryngoscope* **102:** 946–950.

Mackay, I. S. (1976) The treatment of pharyngeal pouch. *Journal of Laryngology and Otology* **90:** 183–190.

Maran, A. G. D., Wilson, J. A., Al Muhanna, A. H. (1986) Pharyngeal diverticula. *Clinical Otolaryngology* **11:** 219–255.

Maran, A. G. D., Gaze, M., Wilson, J. A. (1993) Benign disease of the neck. In *Stell and Maran's Head and Neck Surgery.* 3rd Edition, Butterworth-Heinemann Ltd., Oxford, pp 72–73.

Martin-Hirsch, D. P., Newbegin, C. J. (1993) Autosuture GIA gun: a new application in the treatment of hypopharyngeal diverticula. *Journal of Laryngology and Otology* **107(8):** 723–725.

Mosher, H. P. (1917) Webs and pouches of the esophagus, their diagnosis and treatment. *Surgery Gynecology Obstetrics* **25:** 175–187.

Parker, A. J., Hawthorne, M. R. (1988) Endoscopic diverticulotomy versus external diverticulectomy in the treatment of pharyngeal pouch. *Journal of the Royal College of Surgeons of Edinburgh* **33:** 61–64.

Scher, R. L., Richtsmeier, W. J. (1996) Endoscopic staple-assisted esophagodiverticulostomy for Zenker's diverticulum. *Laryngoscope* **106(8):** 951–956.

Todd, G. B. (1974) The treatment of pharyngeal pouch. *Journal of Laryngology and Otology* **88:** 307–315.

van Overbeek, J. J., Hoeksema, P. E. (1982) Endoscopic treatment of the hypopharyngeal diverticulum: 211 cases. *Laryngoscope* **92:** 88–91.
van Overbeek, J. J. (1994) Meditation on the pathogenesis of hypopharyngeal (Zenker's) diverticulum and a report of endoscopic treatment in 545 patients. *Annals of Otology, Rhinology and Laryngology* **103:** 178–185.
Weerda, H., Ahrens, K. H., Schlenter, W. W. (1989) Measures for reducing the rate of complications in endoscopic surgery of Zenker's diverticulum. [German]. *Laryngo-Rhino-Otologie* **68:** 675–677.
Wouters, B., van Overbeek, J. J. (1990) Pathogenesis and endoscopic treatment of the hypopharyngeal (Zenker's) diverticulum. [Review]. *Acta Gastroenterologica Belgica* **53:** 323–329.

Address for correspondence:
Astrid K. Bieger M.D., F.R.C.S. (Glas.),
Department of Otorhinolaryngology,
Bradford Royal Infirmary,
Duckworth Lane, Bradford BD9 6RJ.

Fax: 01274 364895