*The Journal of Laryngology and Otology*
May 1993, Vol. **107**, pp. 430–433

# Complications of pharyngeal myotomy for alaryngeal voice rehabilitation

P. M. J. Scott, F.R.C.S.,* N. R. Bleach, F.R.C.S.,* A. R. Perry, Ph.D.,** A. D. Cheesman, F.R.C.S.*

**Abstract**
Over the eight-year period to May 1991, 256 patients were referred for post-laryngectomy voice rehabilitation. Videofluoroscopy identified 81 (32 per cent) who required pharyngeal myotomy for a spastic pharyngo-oesophageal segment. Forty-two of these (37 male, 5 female and average age 63 years) had their surgery performed at this unit with a complication rate of 17 per cent and an average post-operative stay of 10 days (range 4–41 days). The place of the operation for pharyngeal myotomy in post-laryngectomy voice rehabilitation is discussed.

**Key words: Speech, alaryngeal; Pharyngeal muscles, surgery.**

## Introduction

In the last one hundred years the operative mortality for laryngectomy has fallen from 34 per cent (Holinger, 1975) to 1 per cent (Robin *et al.*, 1987). Over the same period, the one year survival of 13 per cent (Holinger, 1975) has risen so that now 77 per cent are disease free at one year (Robin *et al.*, 1987). With more people surviving laryngectomy, voice rehabilitation has become increasingly important. Historically, the cornerstone of voice rehabilitation has been oesophageal voice. Reported success in acquisition of this varies from 24 per cent to 90 per cent of laryngectomies, with an average of 64 per cent (Salmon, 1988). In a very selected group of successful laryngectomy patients (Jay *et al.*, 1991), 56 per cent felt they had acquired satisfactory oesophageal voice and 78 per cent of all the patients were satisfied with their voice rehabilitation. Despite these figures, 64 per cent of the whole group found their loss of voice a disability. In 1980, Blom and Singer reported their technique of tracheo-oesophageal puncture. The advance in their approach to voice rehabilitation was both the use of a one-way disposable valved prosthesis to stent a tracheo-oesophageal puncture (TEP) and the recognition of the importance of the pharyngo-oesophageal segment in all air driven forms of voice rehabilitation (Blom *et al.*, 1980). Using pharyngo-oesophageal tonus as the basis of voice rehabilitation, it is possible to achieve initial success in as many as 94 per cent of patients who had puncture as a secondary procedure subsequent to laryngectomy (Perry *et al.*, 1987).

Kirchner *et al.* measured crico-pharyngeal pressure in laryngectomies in 1963. In 1974, Winans *et al.* modified Kirchner's technique and studied a group of failed oesophageal speakers and found high crico-pharyngeal pressures were associated with failed oesophageal voice. Perry (1989) has since classified oesophageal speakers and non-speakers in terms of pharyngo-oesophageal segment tonus. Based on acoustic and manometric measurements, a five group classification of pharyngo-oesophageal tone was recognized: hypotonic, tonic, hypertonic, spasm and stricture. Those with increased pharyngo-oesophageal tone (i.e. hypertonic or spasm) or those with pharyngeal stricture have less chance of developing TEP or oesophageal voice. This can be demonstrated prior to TEP by passive air insufflation (Blom *et al.*, 1985). In 1981, Blom and Singer reported the successful use of pharyngeal myotomy to reduce pharyngo-oesophageal tonus (Blom *et al.*, 1981b). The success of this technique has since been confirmed by Chodosh *et al.* (1984). Those with hypertonic or spastic pharyngo-oesophageal tone can be identified radiologically (McIvor *et al.*, 1990) and may then be offered a planned pharyngeal myotomy as part of secondary surgical voice rehabilitation after laryngectomy.

Initially there was concern regarding the potential complications of this surgery. Pharyngeal myotomy is being carried out in an irradiated and previously operated field so the likelihood of complications was assumed to be high. Here we review our experience with the operation and its complications.

## Materials and methods

From the speech therapy department's records all patients referred for post-laryngectomy voice rehabilitation between May 1983 and May 1991 were analysed. From this group of 256, those who were recommended to have a myotomy because of spasm of the pharyngo-oesophageal segment were identified. These numbered 81 (32 per cent) of whom 39 were excluded (Table I).The basis of this study was the remaining 42 patients who have undergone myotomy in this unit.

The details of the surgery are available elsewhere (Blom *et al.*, 1981b) and will not be reiterated here.

From the Departments of Speech Therapy* and Otolaryngology,** Charing Cross Hospital, Fulham Palace Road, Hammersmith, London W6 8RF.
Accepted for publication: 31 December 1992.

TABLE I
EXCLUSIONS

| | Number | % |
|---|---|---|
| Offered operation | 81 | 100 |
| Refused operation | 10 | 12 |
| Operation elsewhere | 8 | 10 |
| Awaiting operation | 16 | 20 |
| No records | 2 | 6 |
| Total exclusions | 39 | 48 |

## Results

*Age and sex*

There were 37 (88 per cent) male and five (12 per cent) female patients whose average age was 63 years (range 48–77). All the patients had an initial diagnosis of squamous cell carcinoma of the larynx which accounts for the age and sex distribution. The myotomy was performed on average 3.5 years (range 1–17 years) following total laryngectomy.

*Post-operative recovery*

In the usual uncomplicated case the patient is fed post-operatively by a tube placed through the tracheo-oesophageal puncture (TEP). Oral fluids are allowed from the second day and by the fourth post-operative day full diet has been reintroduced. On the fourth or fifth day the tube is replaced by a Blom-Singer voice prosthesis. Occasionally the TEP is swollen and uncomfortable and fitting of the prosthesis is then delayed a few days. Following fitting of the voice prosthesis, approximately five days are spent instructing the patient in the use and care of it and of the outer tracheostoma valve. An average of 10 days post-operative stay was, thus, expected. A post-operative stay of greater than ten days implies that the post-operative period was prolonged by complications. On average the patients did spend 10 days in hospital post-operatively (range 4–41 days). Those staying as short as four days in hospital only had a pharyngeal myotomy without a TEP. Ten patients had their TEP delayed. In the early cases this was routine; however, now only those in whom endoscopy and TEP are not technically possible have TEP delayed. In all cases following myotomy TEP was possible at a later date.

*Complications*

There were complications of surgery during the inpatient stay in seven patients (17 per cent). These are detailed in Table II together with their incidence and the length of associated post-operative stay. As complications cause a prolonged post-operative stay, its length is a useful guide to recovery and complication severity. The most severe complication recorded was that of pharyngeal leakage in three patients (7 per cent). These three patients stayed in hospital 30 days on average while the rest of the patients stayed, on average, eight days. In two patients the diagnosis of a pharyngeal leak was made clinically on the basis of saliva in the neck drains and confirmed radiologically by semi-solid contrast swallow. The drains were left in position and the patients fed by a tube through the tracheo-oesophageal fistula into the oesophagus. When salivary drainage had ceased the drains were removed. In the third case, a tender neck swelling developed following removal of the drain. Semi-solid contrast radiology confirmed this to be a pharyngeal leak. It is possible that the high pressure at the tip of the suction drain led to mucosal necrosis and leakage. In no patient did an uncontrolled fistula develop and all three cases were successfully managed conservatively. Despite the pharyngeal leak, all three patients developed useful voice.

One patient had a nasogastric tube passed rather than a tracheo-oesophageal tube following myotomy without TEP. On the third post-operative day he swallowed the naso-gastric tube and required a laparotomy for its removal. This is not regarded as a complication likely to be repeated.

There were five patients whose original laryngectomy was associated with a pharyngo-cutaneous fistula. None of these five suffered complications after pharyngeal myotomy and, on average, had a comparable length of post-operative stay to the whole group (nine days).

*Radiotherapy*

Only two patients (5 per cent) had no radiotherapy. The remaining 40 patients (95 per cent) had radiotherapy at differing stages in their management. Twenty-four (57 per cent) received 'curative' radiotherapy prior to laryngectomy, although for eight of these the interval is not recalled by the patient. The remaining 16 had 'curative' radiotherapy an average of 1.5 years (range 3 months to 5 years) prior to laryngectomy. Nine other patients (21 per cent) had a full course of post-operative radiotherapy as planned treatment immediately following laryngectomy. Two (5 per cent) received treatment after their laryngectomy for recurrent disease and five could not recall when treatment was given. Due to the wide geographic area of referrals there is no uniformity in the dosage of the radiotherapy given. As the referrals were from consultant otolaryngologists or general practitioners and not radiotherapists there was no accurate record of radiotherapy dosage with the patient's referral.

In Table III the length of post-operative stay is recorded for each of the above groups. The five patients who were unaware of the exact timing of their radiotherapy and the

TABLE II
COMPLICATIONS

| Complication | Number | % | Post-operative stay (days) |
|---|---|---|---|
| Pharyngeal leak | 3 | 7.0 | 30 |
| Evacuation of haematoma | 1 | 2.5 | 4 |
| Wound infection | 1 | 2.5 | 6 |
| Swallowed nasogastric tube | 1 | 2.5 | 20 |
| Valve aspiration | 1 | 2.5 | 6 |

TABLE III
RADIOTHERAPY

| Timing of radiotherapy | Patients | Post-operative stay (days) |
|---|---|---|
| Prior to laryngectomy | 24 | 9 |
| With laryngectomy | 9 | 9 |
| Post-laryngectomy | 2 | 15 |
| Unknown timing of radiotherapy | 5 | 15 |
| No radiotherapy | 2 | 7 |

https://doi.org/10.1017/S0022215100123345 Published online by Cambridge University Press

TABLE IV
GRADE OF SURGEON

| Grade of surgeon | Number | Post-operative stay (days) | Complication (number) |
|---|---|---|---|
| Consultant | 13 | 10 | 2 |
| Senior registrar | 27 | 10 | 5 |
| Registrar | 2 | 10 | 0 |

two patients who were treated for a recurrence prior to their myotomy stayed in hospital for 15 days as opposed to the seven to nine days for the other groups. Although this suggests a trend, the first group is too heterogenous and the second group is too small for comment. It is unfortunate that exact details of radiotherapy regimens are unavailable but from the above data there is no clear association between radiotherapy and post-operative stay.

*Grade of surgeon*

In Table IV are details of the operations by grade of surgeon. Post-operative stay is the same in each group. The consultant (ADC) had a complication rate of 16 per cent as opposed to the higher 19 per cent recorded by the senior registrars. This is not a significant statistical difference ($p>0.05$ by Chi-squared). As only two operations were performed by registrar grade surgeons this group is too small for fair comparison.

*Antibiotics*

Over the eight years of the study, there has been no consistent policy regarding the use of antibiotic prophylaxis (Table V). Thirteen patients had no antibiotics. Of the remaining 29, seven were given oral antibiotics starting more than 24 hours after surgery, a regimen which cannot be considered effective prophylaxis. The remaining 22 patients received a variety of agents (usually ampicillin or cefuroxime with or without metronidazole) intravenously at the time of surgery. This lack of consistency prevents any conclusions being drawn. In some patients, especially those who developed a pharyngeal leak, the use of antibiotics was prolonged from prophylaxis to treatment.

*Age*

In Table VI the average age (+/– standard deviation) is recorded. The average age of the whole group, the group with complications and the group with no post-operative problems is almost identical. Age would not, therefore appear to be a predictor of complications.

TABLE V
ANTIBIOTIC USAGE

| Timing of antibiotics | Number | Post-operative stay (days) | Complication (number) |
|---|---|---|---|
| No antibiotics | 13 | 7 | 1 |
| After 24 hours | 7 | 9 | 2 |
| Within 24 hours | 22 | 11 | 4 |

TABLE VI
AGE AND RISK

| Group | Average age (± SD) (years) |
|---|---|
| All patients | 63 ± 8.2 |
| Complications | 64 ± 8.2 |
| No complications | 63 ± 8.2 |

## Discussion

Blom *et al.* (1986) report that almost 40 per cent of patients assessed for secondary voice rehabilitation require pharyngeal myotomy. This compares favourably with 81 patients recommended myotomy in a total of 256 assessed by us (i.e. 32 per cent myotomy rate). This figure would explain the fact that, on average, 64 per cent of laryngectomies develop satisfactory oesophageal voice (Salmon, 1988). The 36 per cent unable to develop oesophageal voice may well have an unsuitable pharyngo-oesophageal segment and, if assessed by videofluoroscopy and air insufflation (McIvor *et al.*, 1990), may be shown to benefit from pharyngeal myotomy. Perry *et al.* (1987) have used this approach to secondary voice rehabilitation following laryngectomy and have attained a success rate of 94 per cent .

In their original description of the operation, Blom and Singer report their complications in a group of 22 patients (Blom *et al.*, 1981a) but do not include details of radiotherapy, patient age or previous surgery. Their complication rate was seven out of 22 (i.e. 32 per cent): two wound infections; one wound haematoma; three with post-operative gastro-oesophageal reflux; and one myocardial infarction. They have since quoted a possible fistula rate of eight to nine per cent (Blom *et al.*, 1986). In our series the total complication rate of 17 per cent with an actual fistula rate of 7 per cent compares favourably. There appears to be no predictor of fistula formation. Pharyngo-oesophageal fistula may be a technical problem related to the surgery. The pharyngeal mucosa is at risk in the operation and if it is entered inadvertently, not recognized and closed it is likely that a fistula will form. We routinely use a suction drain. If this rests against the pharyngeal mucosa it is possible that the pressure of the suction may render a small area ischaemic and facilitate formation of a fistula.

Following simple laryngectomy, complication rates are shown to correlate with total dose of pre-operative radiotherapy (Johansen *et al.*, 1988). We could not record total doses of radiotherapy, but its timing had little influence on complications or post-operative recovery. Following laryngectomy, a post-operative Hb below 10 gm/l correlates with pharyngo-cutaneous fistula formation (Lavelle and Maw, 1972). Myotomy is a procedure with a much smaller blood loss and all our patients had a Hb above 10 gm/l pre-operatively. No patient required a transfusion and only two patients were felt to have lost sufficient blood to warrant a post-operative haemoglobin check. Haemoglobin cannot be considered a risk factor for developing a complication following myotomy.

The outcome of head and neck surgery has been improved by the introduction of antibiotics. It is now established that antibiotics, particularly in the first 24 hours post-operation significantly decrease post-operative morbidity (Johnson and Yu, 1988). In this retrospective study we are unable to assess with any certainty the place of antibiotic prophylaxis. Complication rate and post-operative stay are our two main indicators of adverse operative outcome. Neither of these are affected by the use of

antibiotics, age of the patient, previous radiotherapy or the grade of the operating surgeon.

## Conclusion

A total complication rate of 17 per cent is significant to any operation. Controlled pharyngo-cutaneous fistula, the most serious recorded complication, had an incidence of 7 per cent. In view of the high risk population undergoing this procedure (age, fibrosis following previous surgery and radiotherapy) we believe the complication rate is acceptable. This risk must also be balanced against the considerable benefit that voice rehabilitation has on the quality of the patient's life. This is often dramatic and emotional in the patient who has been aphonic since his laryngectomy. It is worth noting that the three patients with the most severe complication (i.e. pharyngeal leak) all developed satisfactory tracheo-oesophageal fistula voice and felt the voice they acquired was worth the prolonged period of hospital stay. Thus, although complications prolong hospital stay, they appear not to ultimately affect satisfactory voice production following secondary surgical voice restoration by TEP and pharyngeal myotomy.

Age, previous radiotherapy or complications of laryngectomy are not now considered contradictions to voice rehabilitation and myotomy. It is important that each patient is assessed as an individual and the input of a dedicated, co-ordinated multidisciplinary team of voice therapists, surgeons, radiologists and nurses ensures that a large proportion of patients develop satisfactory voice. Even with such an approach, some patients still fail to develop voice despite successful surgery. In the series of Perry *et al.* (1987) failures were related to alcohol abuse, poor eye/hand co-ordination and low mental aptitude. These are reasons not to manage a voice prosthesis, but creating a favourable pharyngo-oesophageal tonus with a myotomy greatly improves ability to develop oesophageal voice (Chodosh *et al.*, 1984).

We have not shown a risk from the use of antibiotics, so despite any clear benefit, we prescribe antibiotics for the first 24 hours post-operatively. Normally this would now be a combination of a cephalosporin and metronidazole. In view of the possible trauma from suction drains these are still used but cut to a short length and placed away from exposed pharyngeal mucosa.

We were initially selective when offering the operation of pharyngeal myotomy. We now identify those patients with pharyngo-oesophageal spasm radiologically with an air insufflation test. Following a full explanation of the operation and the rehabilitation, unless there are contraindications to anaesthesia, all suitable subjects are offered the operation.

## Acknowledgement

We are grateful for the assistance of Dr J. McIvor in preparing the manuscript.

### References

Blom, E. D., Singer, M. I. (1980) An endoscopic technique for restoration of voice following laryngectomy. *Annals of Otology, Rhinology and Laryngology* **89:** 526–533.

Blom, E. D., Singer, M. I., Hamaker, R. C. (1981a) Further experience with voice restoration after total laryngectomy. *Annals of Otology, Rhinology and Laryngology* **90:** 498–502.

Blom, E. D., Singer, M. I. (1981b) Selective myotomy for voice restoration after total laryngectomy. *Archives of Otolaryngology* **107:** 670–673.

Blom, E. D., Singer, M. I., Haymaker, R. C. (1985) An improved esophageal insufflation test. *Archives of Otolaryngology* **111:** 211–212.

Blom, E. D., Singer, M. I., Haymaker, R. C. (1986) Pharyngeal plexus neurectomy for alaryngeal speech rehabilitation. *Laryngoscope* **96:** 50–53.

Chodosh, P. L., Giancarlo, H. R., Goldstein, J. (1984) Pharyngeal myotomy for vocal rehabilitation post laryngectomy. *Laryngoscope* **94:** 52–57.

Holinger, P. H. (1975) A century of progress of laryngectomies in the northern hemisphere. *Laryngoscope* **85:** 322–332.

Jay, S., Ruddy, J., Cullen, R. J. (1991) Laryngectomy: the patient's view. *Journal of Laryngology and Otology* **105:** 934–938.

Johansen, L. V., Overgaard, J., Elbrond, O. (1988) Pharyngo-cutaneous fistulae after laryngectomy. *Cancer* **61:** 673–678.

Johnson, J. T., Yu, V. L. (1988) Antibiotic use during major head and neck surgery. *Annals of Surgery* **207:** 108–111.

Kirchner, J. A., Scatliff, J. H., Dey, F. L., Shedd, D. P. (1963) The pharynx after laryngectomy. *Laryngoscope* **73:** 18–33.

Lavelle, R. J., Maw, A. R. (1972) The aetiology of post-laryngectomy pharyngo-cutaneous fistulae. *The Journal of Laryngology and Otology* **86:** 785–793.

McIvor, J., Evans, P. F., Perry, A. D., Cheesman, A. D. (1990) Radiological assessment of post-laryngectomy speech. *Clinical Radiology* **41:** 312–316.

Perry, A., Cheesman, A. D., McIvor, J., Charlton, R. (1987) A British experience of surgical voice restoration techniques as a secondary procedure following total laryngectomy. *The Journal of Laryngology and Otology* **101:** 155–163.

Perry, A. (1989) Voice rehabilitation after laryngectomy. Unpublished Ph.D. Thesis (CNAA).

Robin, P. E., Olofson, J. (1987) Tumours of the larynx. In *Scott-Brown's Diseases of Ear, Nose and Throat.* 4th Edition. (Stell, P. M., Kerr, A. G., eds.), Butterworths, London, pp 186–234.

Salmon, S. J. (1988) Factors predictive of success or failure in acquisition of oesophageal speech. *Head and Neck Surgery* **(Supp II):** 105–109.

Winans, C. S., Elliot, J. R., Waldrop, W. F. (1974) Esophageal determinants of alaryngeal speech. *Archives of Otolaryngology* **99:** 10–14.

Address for correspondence:
P. M. J. Scott, F.R.C.S.,
11A Ellerslie Road,
Shepherds Bush,
London W12 7BN.