Comparison of long-term results of total fundoplication gastroplasty and Belsey Mark IV antireflux operations in relation to the severity of oesophagitis

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Received 21 September 1998; received in revised form 15 December 1998; accepted 12 January 1999

Abstract

Objective: Belsey Mark IV (BM IV) and total fundoplication gastroplasty (TFG) were the standard anti-reflux operations in two consecutive periods in Nottingham City Hospital Thoracic Surgery Unit. The aim of this study was to compare the long-term results obtained by these two procedures emphasizing their relation to the severity of the oesophageal mucosal damage. Methods: Ninety patients (50 females and 40 males with a mean age of 57 years) who had a BM IV operation between 1976 and 1983 and 86 patients (46 females and 40 males, with a mean age of 56.5 years) undergoing a TFG procedure between 1983 and 1986 were evaluated. All patients were assessed preoperatively by means of clinical history, barium meal and endoscopy. In addition, 72 of the patients having a TFG had prolonged pH monitoring and manometric studies. The unit policy is for life-long follow-up. The symptoms at review were assessed and graded according to the criteria published by Orringer et al. (Orringer MB, Skinner DB, Belsey RHR. Long-term results of the Mark IV operation for hiatal hernia and analyses of recurrences and their treatment. J Thorac Cardiovasc Surg 1972;63:25–33) [3].

Results: In the BM IV group there was one post-operative death (1.1%). The median follow-up was 11 years (range 3–18 years). Overall good results were achieved in 64 patients (71.9%). In patients without oesophagitis (n = 24) the success rate was 91.7% while for grades I (n = 17), II-III (n = 36) and IV (n = 12) oesophagitis this was 76.5, 66.7 and 41.7%, respectively (P = 0.01). The actuarial success rate at 10 through to 18 years was 71.0%. In the TFG group there was no postoperative death. The median follow-up was 10 years (range 2–14 years). Overall good results were achieved in 78 patients (90.7%). In the absence of oesophagitis (n = 10) the success rate was 90.0% and for grades I (n = 12), II-III (n = 26) and IV (n = 38) oesophagitis this was 91.6, 92.3 and 89.4%, respectively. The actuarial success rate at 10 through to 14 years was 90.3%. The differences in the overall success rate (P = 0.002), the success rates for grades II-III (P = 0.02) and IV (P = 0.001) oesophagitis and the long-term actuarial success rates (P = 0.001) were significant. Conclusion: These data provide evidence on the superiority of the TFG against the BM IV in achieving long-term relief of reflux symptoms in the presence of severe oesophagitis. We believe that failure of BM IV in this setting is due to obvious or subtle oesophageal shortening. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Belsey Mark IV; Total fundoplication gastroplasty; Oesophagitis

1. Introduction

Important features of gastro-oesophageal reflux disease (GORD) are the presence of a defective lower oesophageal sphincter and the inability of the lower oesophageal body to clear the normal acid reflux episodes. The main principles of anti-reflux surgery are the establishment of a long segment of the oesophagus within the positive pressure environment of the abdomen and the re-enforcement of the lower oesophageal sphincter with an artificial valve avoiding, at the same time, the side effects caused by its over-competence [1].

Although the long-term results of the Belsey Mark IV (BM IV) anti-reflux procedure in patients with uncomplicated gastro-oesophageal reflux disease were gratifying, in the presence of ulcerative oesophagitis or stricture, in our experience [2] and the experience of others [3,4], these were
less satisfactory. Oesophageal shortening creating tension on the repair was felt to be an important reason for the recorded failures.

The combination of oesophageal lengthening (Collis gastroplasty) [5] with total fundoplication (Nissen) [6] was introduced by Henderson [7], to provide anatomic stability for a tension-free repair with simultaneous effective reflux control, and the long-term results reported by the same author in patients with a variety of pathological stages of GORD were most encouraging [8].

In this retrospective study, we compared the long-term clinical results obtained by using the BM IV and total fundoplication gastroplasty (TFG) as the standard anti-reflux procedures in two consecutive periods in our unit, in relation to the severity of the oesophageal mucosal damage.

2. Patients and methods

Between January 1976 and February 1983, 96 patients underwent a BM IV anti-reflux operation in Nottingham City Hospital Thoracic Surgery Unit. Six patients who were lost to follow-up and one patient who died in hospital were not included in this study; the remaining 89 patients (49 females and 40 males with a mean age of 57 years, range 26–79 years) were available for analysis.

The outcome on these patients has been first reported in 1989 [2]. The present report provides a fully updated follow-up with analyses of the recurrences and their treatment.

The high number of early recurrences observed in the patients having grades II-III or IV oesophagitis – attributed to the obvious or subtle oesophageal shortening creating tension on the repair and predisposing to failure – led us to adopt TFG as the standard procedure between March 1983 and January 1986. During this period, 89 patients had a TFG procedure. Three patients have failed to attend the follow-up clinic; the remaining 86 patients (46 females and 40 males with a mean age of 56.5 years, range 23–78 years) are amongst the subjects of this report.

Patients having resectional surgery, previous oesophageal or gastric operations, scleroderma, achalasia or other anti-reflux procedures and those undergoing repair of para-oesophageal hernias without having evidence of gastro-oesophageal reflux during the study period did not form part of this study.

2.1. Preoperative assessment

All patients were assessed by means of clinical history, barium swallow and endoscopy. As from 1983, the full range of facilities became available in our department. 78 patients in the TFG group had oesophageal manometry and prolonged pH monitoring.

At endoscopy, oesophagitis was assessed as grade I–mild, erythematous changes, grades II and III–superficial or deep ulcerations with or without deeper necrosis and grade IV–stricture with/or Barrett’s metaplasia. The presence of oesophagitis was confirmed by the histological examination of oesophageal mucosal biopsy specimens in most instances.

The diagnosis of GORD was based on clinical grounds and the combination of the findings of the above investigations.

2.2. Indication for surgery

All patients had a trial of full medical treatment with H2-receptor antagonists and alginic acid preparations, as well as dilatations as required, which had failed to control the symptoms and/or the evolution of the pathological changes induced by GORD, before they were submitted to surgery.

2.3. The operations

The operative technique for BM IV and total fundoplication (Nissen) gastroplasty have been described in detail elsewhere and need not to be repeated here [3,7]. It should be only noted that the length of wrap in the TFG group was tailored to a maximum of 1 cm, guided by the findings of the preoperative manometry [8,9].

2.4. Postoperative management

Patients were given fluids orally after 48 h and semisolids and solids the ensuing days. A barium meal was always performed before patients’ discharge from the hospital to ensure satisfactory radiographic appearance of the repair.

2.5. Postoperative assessment

The unit policy is for life-long follow-up. Patients were interviewed at the out-patient clinics 6 weeks after the operation, 3 monthly for the first year, 6 monthly for the 2nd year, yearly until the 10th year and every 2 years thereafter.

Interviews were conducted by the consultant thoracic surgeon or by the resident medical staff. Patients were specifically asked for the presence of recurrent symptoms of GORD and/or for new symptoms such as dysphagia, difficulties in belching, symptoms of gas bloat syndrome and post-thoracotomy incisional pain.

Symptoms were graded according to the previously published criteria as A (asymptomatic), B (completely relieved of all reflux symptoms but with mild non-specific complaints), C (symptomatic of reflux or appearance of new persistent procedure related symptoms but without objective evidence of recurrence on re-investigation) and D (documented recurrent hiatus hernia and/or reflux) [3].

A and B were considered as excellent and good results and C and D as failures.

Patients with recurrent or persistent new symptoms were
re-investigated where possible by means of barium meal, endoscopy, manometry and pH studies. Patients without symptoms had simply their appointment renewed.

The information obtained from the patients most recent outpatient visit was used for the evaluation of the outcome unless recurrent symptoms or side effects became apparent earlier.

2.6. Statistics

Means were compared with Students t-test, medians with Mann–Whitney U or Kruskal–Wallis test and proportions with Chi square or Fisher’s exact test as appropriate. The actuarial success rate (freedom from recurrent symptoms or side effects of the operation) for each procedure, were calculated using the Kaplan–Meier method and compared with Log rank and Wilcoxon tests. A $P$-value of less than 0.05 was considered significant. All statistical analyses were done using the statistical package SPSS PC (version 7.5) (SPSS, 444 N. Michigan Avenue, Chicago, IL, 60611).

3. Results

3.1. Preoperative evaluation

Heartburn, regurgitation and dysphagia were the most common symptoms in both groups with the latter being significantly more prevalent amongst patients having a Nissen gastroplasty (Table 1).

A similarly high proportion of patients in both groups had hiatus hernia demonstrated on radiography (Table 2). Patients in the BM IV group were more likely to have no oesophageal mucosal damage ($P = 0.01$) and they were less likely to have grade IV oesophagitis than their counterparts having a Nissen gastroplasty ($P < 0.0001$) (Table 2).

Barrett’s oesophagus was present in two patients in BM IV (2.7%) and in nine (10.5%) in TFG group ($P = 0.03$).

3.2. Operative mortality and postoperative complications

There was one death in a 84-year-old female (BM IV group) (1.1%) who suffered acute myocardial infarction on the 6th postoperative day. There were no deaths amongst the patients in the TFG group.

There was one case of oesophageal leak (TFG group) caused by the preoperative dilation of a tight stricture manifested clinically on the third postoperative day and a case of gastric perforation (BM IV group), both resulting in the formation of a hiatal abscess necessitating open surgical drainage.

Complications occurring after patients have been discharged from the hospital are listed in Table 4. Although more patients in the TFG group experienced early ($P = 0.02$) or moderate dysphagia, requiring one to three dilatations within 1 year of the operation ($P = 0.03$), there was no significant difference in the prevalence of severe persistent dysphagia amongst the two groups. Patients having a TFG had somewhat higher incidence of gas bloating, difficulties in belching, flatulence and incisional pain but not significantly so (Table 4).

3.3. Follow-up

Twenty one patients died from causes unrelated to the gastro-oesophageal reflux disease in BM IV group. The median follow-up was 11 years (range 3–18 years) with 82 patients (91.1%) being followed up for more than 5

Table 2

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>BM IV</th>
<th>Nissen gastroplasty</th>
<th>Chi square or Fisher’s test ($P$-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiatus hernia on radiography</td>
<td>71 (80.0%)</td>
<td>78 (91.0%)</td>
<td>0.1</td>
</tr>
<tr>
<td>No oesophagitis</td>
<td>24 (27.0%)</td>
<td>10 (11.6%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Grade I oesophagitis</td>
<td>17 (19.1%)</td>
<td>12 (14.0%)</td>
<td>0.4</td>
</tr>
<tr>
<td>Grade II and III oesophagitis</td>
<td>36 (40.4%)</td>
<td>26 (30.2%)</td>
<td>0.2</td>
</tr>
<tr>
<td>Grade IV oesophagitis</td>
<td>12 (13.5%)</td>
<td>38 (44.2%)</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Minor respiratory problems and atrial fibrillation were the usual early postoperative complications in both groups, as shown in Table 3.

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</tr>
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</tr>
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<td>10 (11.6%)</td>
<td>0.01</td>
</tr>
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<td>12 (14.0%)</td>
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Table 3

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<thead>
<tr>
<th>Early postoperative complications</th>
<th>BM IV</th>
<th>Nissen gastroplasty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory complications</td>
<td>7 (7.8%)</td>
<td>9 (10.5%)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>5 (5.6%)</td>
<td>6 (7.0%)</td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td>3 (3.3%)</td>
<td>None</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>None</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>1 (1.1%)</td>
<td>None</td>
</tr>
<tr>
<td>Wound infection</td>
<td>3 (3.4%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Oesophageal tear – leak</td>
<td>None</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Gastric perforation</td>
<td>1 (1.1%)</td>
<td>None</td>
</tr>
<tr>
<td>Bleeding – re-opening</td>
<td>1 (1.1%)</td>
<td>None</td>
</tr>
<tr>
<td>Oesophageal obstruction (food bolus)</td>
<td>1 (1.1%)</td>
<td>3 (3.5%)</td>
</tr>
</tbody>
</table>

$P$, non-significant (Chi square or Fisher’s test).
years and 68 patients (76.4%) for more than 10 years (Table 5).

Fourteen patients had died by the end of the study period in the TFG group. The median follow-up was 10 years (range 2–14 years) with 76 patients (88.3%) being followed up for more than 5 years and 50 patients (58.1%) for more than 10 years.

The overall median follow-up was, as it would have been expected, longer in BM IV group ($P = 0.0001$) (Table 5).

### 3.4. Patients with successful outcome

#### 3.4.1. BM IV group

Sixty-four patients (71.9%) had an excellent or good (A or B) result; the degree of oesophagitis appeared to be an important factor affecting the outcome with patients with no oesophagitis having a success rate of 91.7%, whereas those with grade IV oesophagitis only 41.7% ($P = 0.01$) (Table 6).

#### 3.4.2. Total fundoplication gastroplasty group

Seventy-eight patients (90.7%) had an excellent or good result with the success rate remaining high regardless of the degree of inflammatory damage of the oesophageal mucosa at preoperative endoscopy.

The differences in the overall success rates between the two groups ($P = 0.002$) and the success rates for grades II and III ($P = 0.01$) and grade IV ($P = 0.001$) of oesophagitis were significant (Table 6).

### 3.5. Patients with unsuccessful outcome

#### 3.5.1. BM IV group

Twenty-five patients (28.1%) had a poor (C or D) result. In 21 of them this took place within the first 2 years while four patients became symptomatic 5, 6, 7 and 9 years after their operation, respectively.

Sixteen of these patients were re-investigated; in two of them a cause of recurrent symptoms could not be established; the remaining 14 patients had clearly demonstrable gastro-oesophageal reflux, with 11 (12.3%) amongst them having a recurrent hiatus hernia.

Seventeen patients were treated conservatively, six

---

**Table 4**

Late complications or side effects of the operation

<table>
<thead>
<tr>
<th>Complication</th>
<th>BM IV</th>
<th>Nissen gastroplasty</th>
<th>Chi square or Fisher’s test ($P$-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient dysphagia</td>
<td>16 (18.0%)</td>
<td>27 (31.4%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Moderate dysphagia</td>
<td>9 (10.0%)</td>
<td>20 (23.2%)</td>
<td>0.03</td>
</tr>
<tr>
<td>Persistent severe dysphagia</td>
<td>12 (13.5%)</td>
<td>6 (6.9%)</td>
<td>0.2</td>
</tr>
<tr>
<td>Gas bloating</td>
<td>3 (3.4%)</td>
<td>7 (8.1%)</td>
<td>0.2</td>
</tr>
<tr>
<td>Difficulties in belching</td>
<td>2 (2.2%)</td>
<td>6 (7.0%)</td>
<td>0.1</td>
</tr>
<tr>
<td>Flatulence</td>
<td>1 (1.1%)</td>
<td>4 (4.6%)</td>
<td>0.2</td>
</tr>
<tr>
<td>Post-thoracotomy incisional pain</td>
<td>5 (5.6%)</td>
<td>3 (3.5%)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Table 5**

Length of follow-up period

<table>
<thead>
<tr>
<th>Length of follow-up</th>
<th>BM IV</th>
<th>Nissen gastroplasty</th>
<th>Mann-Whitney $U$ and Kruskall-Wallis tests ($P$-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 years</td>
<td>7 (7.9%) median 48 months</td>
<td>10 (11.6%) median 48 months</td>
<td>0.3</td>
</tr>
<tr>
<td>5–10 years</td>
<td>14 (15.7%) median 88 months</td>
<td>26 (30.2%) median 84 months</td>
<td>0.2</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>68 (76.4%) median 168 months</td>
<td>50 (58.1%) median 136 months</td>
<td>0.001</td>
</tr>
<tr>
<td>Overall</td>
<td>89 (100.0%) median 120 months (range 36–216 months)</td>
<td>86 (100.0%) median 120 months (range 24–168 months)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

result with the success rate remaining high regardless of the degree of inflammatory damage of the oesophageal mucosa at preoperative endoscopy.

The differences in the overall success rates between the two groups ($P = 0.002$) and the success rates for grades II and III ($P = 0.01$) and grade IV ($P = 0.001$) of oesophagitis were significant (Table 6).

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**Table 6**

Overall success and success rates in relation to the degree of oesophagitis

<table>
<thead>
<tr>
<th></th>
<th>BM IV</th>
<th>Nissen gastroplasty</th>
<th>Chi square or Fisher’s test ($P$-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No oesophagitis</td>
<td>64 (71.9%)</td>
<td>78 (90.7%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Grade I oesophagitis</td>
<td>13 (76.5%)</td>
<td>11 (91.7%)</td>
<td>0.3</td>
</tr>
<tr>
<td>Grades II and III oeso-</td>
<td>22 (66.7%)</td>
<td>24 (92.3%)</td>
<td>0.02</td>
</tr>
<tr>
<td>phagitis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade IV oesophagitis</td>
<td>5 (41.7%)</td>
<td>34 (89.5%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Chi square test</td>
<td>$P = 0.001$</td>
<td>$P = 0.9$</td>
<td></td>
</tr>
</tbody>
</table>
patients had a total fundoplication gastroplasty and three had oesophagectomy, with interposition of a short colonic segment in two and a jejunal graft in one case.

The actuarial success rate was 75.0% at 5 years and 71.0% at 10 through to 18 years (Fig. 1).

3.5.2. Total fundoplication gastroplasty group

Eight patients (9.3%) had poor results; six patients became symptomatic within the first 2 years, one 3 years and another one 5 years after the operation.

Re-investigation of these patients revealed no cause for symptoms in three patients; five patients had recurrent gastro-oesophageal reflux but only one of them (1.2%) was shown to have a recurrent hiatus hernia.

Two patients were treated with a re-do TFG, two had oesophagectomy and interposition of a short colonic segment and the remaining four patients were managed conservatively.

The actuarial success rate at 5 and 10 years through to 14 years was 90.3%.

The differences between the two groups in the proportion of patients having a recurrent hiatus hernia (12.3 vs. 1.2%) ($P = 0.004$) and the actuarial long-term success rate ($P = 0.001$) were significant (Fig. 1).

4. Discussion

The goal of surgery for gastro-oesophageal reflux disease is the relief of reflux symptoms and the prevention of complications, such as oesophageal stricture and aspiration pneumonitis with the minimal possible side effects caused by the operation.

In our earlier report, with 6 years median follow-up we found a 91.7% success rate of BM IV in patients, without oesophageal mucosal damage at preoperative endoscopy diminishing in patients with signs of various degrees of inflammation being as low as 50.0% for patients having grade IV of oesophagitis [2]. In the present report with a 11 years median follow-up, the success rate for patients without inflammatory mucosal changes remained the same, whereas in the group of patients with grade IV oesophagitis this has further decreased to 46.0%.

Before us, Orringer et al. [3] have reported a failure rate as high as 45.0% in patients with severe oesophagitis and stricture, whereas Vollan et al. [4] have reported a long-term failure rate of 55.0% in patients with reflux oesophagitis and stricture undergoing the BM IV operation. Lerut et al. [10] have reported an overall success rate of 85.0% in 177 patients with a median follow-up of 4.4 years; more recently, Fenton et al. [11] have reported an actuarial freedom of recurrent symptoms of gastrooesophageal reflux of 84.0%, advocating use of BM IV for the surgical treatment of all types, including the most complicated ones, of reflux disease.

Although technical points in performing a BM IV are of importance, tension on the repair secondary to oesophageal shortening was the main factor incriminated for the recorded failures [2–4]. This is often obvious in the presence of stricture but may be subtle in cases of severe (grade II-III oesophagitis) without stricture. In the latter, it is likely that various degrees of transmural inflammation may diminish the inherent elasticity of the oesophagus causing in effect subtle shortening. Pearson et al. [12] have indeed observed that the incidence of late recurrence of reflux following BM IV repair was higher in patients with severe oesophagitis, in whom an apparently adequate reduction of the hiatal hernia produced some tension on the intrathoracic oesophagus.

The combination of oesophageal lengthening by means of a Collis gastroplasty [5] with a partial [12] or total [7] fundoplication have addressed this problem. A modification of the partial fundoplication with gastroplasty was subsequently described [13], whereas variations of the TFG include the uncut version [14,15] and the Collis–Nissen procedure [16], similar in principle with the TFG but with considerable differences in the fixation and the length of the wrap. These techniques were initially reserved only for patients with stricture and acquired short oesophagus, but their use has later became more liberal.

Henderson and Marraytt reported a success rate of 93.1% in 355 patients with 5 or more years follow-up; 130 of these patients had previous gastric or oesophageal operation and five had scleroderma [8]. Success rates of over 90% have been also reported by other authors [14,15,17,18]. The overall success rate of 90.3% in this series with a median follow-up of 11 years is most satisfactory, bearing in mind, however, that none of our patients had previous gastro-oesophageal surgery, a concomitant procedure or scleroderma factors known as predisposing to the failure of an antireflux procedure.

Despite the retrospective nature of this study, the results obtained in the two groups of patients are, we feel, comparable since preoperative assessment, operations, postoperative management, re-investigations and follow-up took place within the same institution under the responsibility of the same surgical team.

There were no differences in the sex and age distribution amongst the two groups.

Patients having a TFG were more likely to have severe ulcerative oesophagitis and/or stricture at preoperative endoscopy (Table 2) than their counterparts in the BM IV group. This would account for the higher prevalence of dysphagia before (Table 1) and for the higher prevalence of early transient and moderate dysphagia after the operation (Table 4) in the TFG group.

Despite having more advanced disease patients, the TFG group had a significantly better overall clinical outcome than patients having a BM IV and uniformly good results across all stages of oesophagitis. An important factor for this may well be the anatomical stability achieved with the long intra-abdominal segment through the gastroplasty manoeuvre (as shown by the low, 1.1%, rate of recurrent...
hiatus hernia in the TFG group sharply contrasting with the 12.3% observed in the BM IV), allowing the construction of a durable tension free repair. This along with the effective reflux control inherent in the total fundoplication would allow the regression even of the more severe forms of oesophagitis [8].

Although total fundoplication has been associated with an increased incidence of procedure-related undesired effects [19], this was not the case in this series with the few patients having gas bloating, difficulties in belching and flatulence being gradually relieved of their symptoms.

Tailoring the length of the floppy fundoplication to a maximum of 1 cm guided by the findings of preoperative manometry [8,9] would seem to be of critical importance for this gratifying finding.

DeMeester et al. [20] in their review of 100 consecutive Nissen fundoplications have reported a significant reduction in the rate of induced severe dysphagia, by reducing the length of the fundoplication from 4 cm (dysphagia 25.0%) down to 1 cm (dysphagia 2.7%).

Despite the good results obtained in patients with all grades of oesophagitis in the TFG group in this series, it would seem that the addition of a gastroplasty in patients with no severe oesophagitis is not required, since comparable results can be achieved through a simple Nissen fundoplication in a wide variety of clinical scenarios induced by gastro-oesophageal reflux disease [4,18,20–25].

Since 1986 we have adopted a tailored approach to anti-reflux surgery. Patients with mild or no oesophagitis and normal oesophageal motility are offered a Nissen fundoplication; those with evidence of impaired motility and minimal or no oesophageal mucosal inflammation are managed with a BM IV. Total fundoplication gastroplasty is reserved for the patients having severe oesophagitis and/or stricture.

The mid- and long-term results of this tailored approach are being continuously evaluated and they will be the subject of a detailed future report.

5. Conclusions

BM IV provides good long-term results at early stages of gastro-oesophageal reflux disease, but is less effective in the patients with advanced inflammatory patholo-gano-tomical changes of the gastro-oesophageal junction. Total fundoplication gastroplasty yields uniformly good results across the spectrum of gastro-oesophageal disease, and is superior to BM IV in the presence of severe oesophagitis or stricture. We continue to believe that failure of BM IV in this setting may be due to obvious or subtle oesophageal shortening.

Acknowledgements

The authors wish to thank Mrs. Lynda Beggs, Thoracic Audit Officer at Nottingham City Hospital for her kind contribution towards the completion of this paper.

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Appendix A. Conference discussion

Mr K Jeyasingham (Bristol, UK): It has long been known that Mark IV, as described by Belsey, is not applicable to grade III and IV. But why do you persevere with it? Now, it has been shown, and Belsey did not have it as an indication, Belsey’s Mark IV was for plain and simple reducible hiatal hernia with or without reflux. In the presence of grade III and IV oesophagitis, it is a contraindication, and he decided that long ago. In those situations, Belsey advocated a resection with a short segment colon interposition. Of course, others tried to do a gastroplasty with a Mark IV type of partial fundoplication or a Nissen type total fundoplication with good results. If you are going to compare for grades III and IV, then you have to do a gastroplasty with partial fundoplication as opposed to total fundoplication, or a Mark IV as opposed to Nissen fundoplication, but not two incomparable situations.

Mr Alexiou: The answer to your comments lie partly along historical grounds. I believe after the high, 45–50%, failure rate reported by Orringer, Skinner and Belsey back in 1971 for patients having stricture-oesophagitis (grade IV), Mr. Belsey suggested that Mark IV was not applicable, only for patients with a short oesophagus.

The time scale when these procedures were performed in our department, 1976–1982, closely follows that report and this was a time when in several institutions, Mark IV was used as the standard anti-reflux procedure. In fact, this would appear to be still the case elsewhere: in a paper coming from the Thoracic surgery service of Dr. Mansour, Atlanta, USA, published in the Annals of Thoracic Surgery in 1998, Belsey Mark IV was quoted with an overall success rate of about 85–90% and the authors recommended this should be the procedure of choice across all stages of oesophagitis, including the more complex ones.

Since total fundoplication gastroplasty and Belsey Mark IV were both considered, at the time, to be suitable for all stages of oesophagitis and were indeed used as such in two consecutive periods by a single surgical firm in our unit, we feel that the results obtained in these two groups of our patients are comparable.

Dr T Lerut (Leuven, Belgium): I just would like to point out, as you wrote in your abstract, that the conclusions of what has been said, we’re already made in 1972, which is a long time before the material that you presented. I can only echo what Mr. Jeyasingham said: in fact what your study shows is that an ill-designed preoperative surgical strategy adversely affected the outcome of your operation. You never should do a Belsey Mark IV on a shortened oesophagus. That is the key of the whole thing. What we have to do especially, when using an abdominal approach through the laparoscope, is to assess very carefully the length by a simple barium swallow. If your GE junction doesn’t reduce under the cardia, you should never try, or you should be very careful in trying an abdominal approach, but rather use the thoracic approach and be prepared for gastroplasty or whatever you think you need to do so.

My main concern is, however, your follow-up. I think it is unacceptable to present only subjective follow-up; and only in case of subjective recurrence go for further objective evaluation. I think you should do on all your patients a subjective and an objective follow-up, including the barium swallow, endoscopy, and 24-h pH study, because there will be a number of patients that are totally asymptomatic, especially the Barrett’s patients. They may remain totally asymptomatic, but present with a full-blown recurrence of objective testing and therefore be at risk for degeneration. And although your study is, indeed, a very long-term follow-up study, there is a cumulative affect of such recurrences over time even after 15, 20, even up to 25 years.

Mr Alexiou: Regarding the postoperative evaluation of our patients, this was based mainly on subjective assessment. We do appreciate the advantages of objective assessment; however, our efforts to recruit asymptomatic patients for such investigations has met a very poor response. I should point out that although the performance of a gastroplasty procedure in patients with shortened oesophagus (grade IV oesophagitis) is generally accepted, we believe that patients having grade III oesophagitis (without obvious oesophageal shortening) may also benefit by lengthening their oesophagus through a gastroplasty procedure and this is the main point of our paper.