

antiserum raised against the 'common' childhood form of ALL, they identified four major subgroups: (i) common ALL (cALL) 73,2%; (ii) T-cell ALL (13,5%); (iii) true 'null' cell ALL (12,6%); and (iv) B-cell ALL (0,7%). The majority of our null cell ALL patients would probably correspond to their cALL group.

Analyses of 379 of these cases showed better remission rates for cALL and null cell ALL than for T-cell ALL and that the duration of remission in cALL was longer than in null cell ALL, while the latter in turn fared better than T-cell ALL. With adjustment for white cell count, however, the prognostic importance of these immunological subgroups is greatly reduced and no statistically significant difference between these subgroups remains except for a T-cell ALL subset which has a poorer prognosis despite modest white cell counts.

This study was supported in part by funds received from the Harry Crossley Foundation.

## REFERENCES

- Hardisty, R. M. and Chessells, J. M. in Hoffbrand, A. V., Brain, M. C. and Hirsch, J., eds (1977): *Recent Advances in Haematology*, pp. 159-173. Edinburgh: Churchill Livingstone.
- Mathé, G., Pouillart, P., Sterescu, M. et al. (1971): *Europ. J. clin. Biol. Res.*, **16**, 554.
- Flandrin, G. and Bernard, J. (1975): *Blood Cells*, **1**, 7.
- Nelson, D. A. (1976): *Sem. Oncol.*, **3**, 201.
- Pantzapoulos, N. and Sinks, L. F. (1974): *Brit. J. Haematol.*, **27**, 25.
- Murphy, S. M., Borella, L., Sen, L. et al. (1975): *Ibid.*, **31**, 95.
- Bennet, J. M., Catovsky, D., Daniel, M-T. et al. (1976): *Ibid.*, **33**, 451.
- Raney, R. B., Festa, R. S., Waldman, M. T. G. et al. (1979): *Amer. J. Haematol.*, **6**, 27.
- Borella, L. and Sen, L. (1975): *J. Immunol.*, **114**, 187.
- Catovsky, D. in Hoffbrand, A. V., Brain, M. C. and Hirsch, J., eds (1977): *Op. cit.*, pp. 201-217.
- Dow, L. W., Borella, L. W., Sen, L. et al. (1977): *Blood*, **54**, 671.
- Viana, M. B., Maurer, H. S. and Ferenc, C. (1980): *Brit. J. Haematol.*, **44**, 383.
- Keleti, J., Révész, T. and Schuler, T. (1978): *Ibid.*, **40**, 501.
- Kass, L. and Schnitzer, M. D. (1975): *Refractory Anemia*, p. 10. Springfield, Ill.: Charles C. Thomas.
- Beard, M. E. J. and Whitehouse, J. M. A. in Hoffbrand, A. V., Brain, M. C. and Hirsch, J., eds (1977): *Op. cit.*, p. 176.
- Janossy, G., Hoffbrand, A. V., Greaves, M. F. et al. (1980): *Brit. J. Haematol.*, **44**, 221.

# Oesophagogastrectomy and total gastrectomy for carcinoma of the stomach

## A plea for subdiaphragmatic resection

L. C. J. VAN RENSBURG

### Summary

Carcinoma of the stomach which involves the gastro-oesophageal junction or cardia is usually advanced by the time the diagnosis is made; resection is therefore often only palliative in nature. Resection is usually performed by a thoraco-abdominal incision. Unfortunately there is a high risk of anastomotic leakage after a total or subtotal proximal gastrectomy and if this occurs within the chest mortality and morbidity are very high. In this article a plea is made for a purely abdominal approach.

*S. Afr. med. J.*, **60**, 773 (1981).

The resectable carcinoma of the gastro-oesophageal junction and cardia can be approached using either a purely abdominal or a thoraco-abdominal exposure. One major problem is that of leakage of the oesophagojejunal or oesophagogastric anastomosis, leading to unacceptable mortality and morbidity.<sup>1,2</sup>

Department of Surgery, Tygerberg Hospital, Parowvallei, CP

L. C. J. VAN RENSBURG, M.MED. (SURG.), F.C.S. (S.A.), F.R.C.S. (ENG.)

Date received: 13 February 1981.

If this leakage occurs after a thoraco-abdominal approach the mortality and morbidity are much higher than with an abdominal approach. While hyperalimentation can save many of these patients, it takes much longer for anastomotic fistulas to seal in the chest with a moving lung than for fistulas in the abdomen to close. In considering the above assertion certain aspects of the problem as a whole should be included, namely the incidence of carcinoma of the stomach at this site, the average resectability rate, the immediate postoperative mortality and morbidity, the final 5-year survival rate, and the feasibility of subdiaphragmatic resection.

### Incidence

Carcinoma of the stomach is least common in the proximal part, an average of only 20 - 30% of lesions being situated there (Table I). Apart from Cady and Choe's<sup>3</sup> series, the incidence is nearer to 20% than 30%.

### Resectability rate

The resectability rate (Table II) varies from 32% to 67%, with an average of 50%. Unfortunately only half of these patients will undergo resection for cure.<sup>11</sup> To operate for cure will depend on the extent of local and distal spread and especially on whether or not the regional lymph nodes are involved. Unfortunately lymph node metastases are present in 60 - 70% of patients by the time they are operated on.<sup>6-8</sup> The problem of adequate oesophageal resection is debatable. Most surgeons will resect 7 cm of

**TABLE I. INCIDENCE OF ADENOCARCINOMA AT THE GASTRO-OESOPHAGEAL JUNCTION AND CARDIA**

|                                   | Incidence (%) | No. of cases studied |
|-----------------------------------|---------------|----------------------|
| Inberg <i>et al.</i> <sup>4</sup> | 14,6          | 2 590                |
| Cassell and Robinson <sup>5</sup> | 16            | 854                  |
| Paulino and Roselli <sup>6</sup>  | 21,5          | 200                  |
| Lundh <i>et al.</i> <sup>7</sup>  | 23            | 321                  |
| Remine and Priestley <sup>8</sup> | 15            |                      |
| White <i>et al.</i> <sup>9</sup>  | 20            | 242                  |
| Cady and Choe <sup>3</sup>        | 33            | 1 323                |
| Fenn <i>et al.</i> <sup>10</sup>  | 18            | 400                  |
| Mean                              | 20            |                      |

**TABLE II. RESECTABILITY RATE FOR STOMACH CARCINOMA**

|  | Resectability (%) | No. of cases studied |
|--|-------------------|----------------------|
| Lumpkin <i>et al.</i> <sup>12</sup>    | 49                | 1 035                |
| Lundh <i>et al.</i> <sup>7</sup>       | 50                | 821                  |
| Cassell and Robinson <sup>5</sup>      | 52                | 854                  |
| Fujimaku <i>et al.</i> <sup>13</sup>   | 67                | 1 376                |
| Burn <sup>11</sup>                     | 50                |                      |
| Inberg <i>et al.</i> <sup>4</sup>      | 46                | 2 590                |
| Hoerr <sup>14</sup>                    | 46                | 484                  |
| Olearchyk <sup>15</sup>                | 47,7              | 243                  |
| Du Pont <i>et al.</i> <sup>1</sup>     | 48                | 1 497                |
| Kairaluoma <i>et al.</i> <sup>16</sup> | 32                | 234                  |
| Tonnesen <i>et al.</i> <sup>17</sup>   | 43                | 100                  |
| Anonymous <sup>18</sup>                | 68                | 1 432                |
| Fenn <i>et al.</i> <sup>10</sup>       | 40                | 400                  |
| Griffith and Davis <sup>19</sup>       | 41                |                      |
| Mean                                   | 49                |                      |

oesophagus above the lesion when it is at the gastro-oesophageal junction and 5 cm when it involves the cardia.<sup>20,21</sup>

### Immediate postoperative mortality

Table III shows that this varies from 5% to 50%, with an average in the region of 16%. The commonest cause of death is a leaking anastomosis.<sup>16,34</sup> The incidence of this vexing problem after oesophagogastrectomy or total gastrectomy varies, figures of 2,6%,<sup>11</sup> 5%,<sup>34</sup> 8%,<sup>19,29</sup> 15%,<sup>7</sup> 18%,<sup>31</sup> 33%,<sup>28</sup> and 50%<sup>35</sup> having been reported. Some surgeons recommend total gastrectomy rather than oesophagogastrectomy to reduce the incidence of leakage at the oesophageal level.<sup>4,6,13</sup>

### Five-year survival rate

Table IV shows that the 5-year survival rate varies from 0% to 27%. The latter figure is the average for patients with no lymph node metastases, the average figure for the whole group being 10,5%. The 5-year survival rate after distal subtotal gastrectomy for carcinoma is better; for example in White *et al.*'s<sup>9</sup> series it was 20,3%, compared with 14,8% for patients with carcinoma in the proximal part of the stomach.

### Methods

Is it possible to carry out a wide resection below the diaphragm?

**TABLE III. OPERATIVE MORTALITY AFTER PROXIMAL AND TOTAL GASTRECTOMY**

|  | Mortality (%) |
|--|---------------|
| Gilbertsen <sup>22</sup>                 | 33,3          |
| Paulino and Roselli <sup>6</sup>         | 15            |
| Lundh <i>et al.</i> <sup>7</sup>         | 23 (P)        |
|  | 35 (T)        |
| Fujimaku <i>et al.</i> <sup>13</sup>     | 5,3 (T)       |
| Remine and Priestley <sup>8</sup>        | 15,4 (T)      |
| White <i>et al.</i> <sup>9</sup>         | 12,9 (P)      |
|  | 18,2 (T)      |
| Inberg <i>et al.</i> <sup>4</sup>        | 16,7          |
| Gunnlangsson <i>et al.</i> <sup>23</sup> | 15            |
| Ellis and Gibb <sup>24</sup>             | 2,8           |
| Jackson <i>et al.</i> <sup>25</sup>      | 19 (P)        |
|  | 14 (T)        |
| Kummerle <sup>26</sup>                   | 18            |
| Hoerr <sup>14</sup>                      | 14            |
| Gatzinsky <i>et al.</i> <sup>27</sup>    | 23            |
| Stone <i>et al.</i> <sup>28</sup>        | 11            |
| Kairaluoma <i>et al.</i> <sup>16</sup>   | 16            |
| Conti <i>et al.</i> <sup>29</sup>        | 23            |
| Desmond <sup>21</sup>                    | 14            |
| Ore <sup>30</sup>                        | 15            |
| Anonymous <sup>18</sup>                  | 1,8           |
| Teitler <i>et al.</i> <sup>31</sup>      | 18            |
| Smith <sup>32</sup>                      | 14,6          |
| Dillon <i>et al.</i> <sup>33</sup>       | 50            |
| Leverment and Milne <sup>34</sup>        | 25            |
| Mean                                     | 16,2          |

P = proximal gastrectomy; T = total gastrectomy.

Virtually the only advantage obtained by using a thoraco-abdominal incision is increased length of oesophagus. Since the introduction of highly selective vagotomy for duodenal ulcer many surgeons have acquired the surgical skill to clear up to 7 cm of the abdominal oesophagus of vagal fibres with the use of various retractors, making the deep subdiaphragmatic recess no longer so inaccessible. Another method of increasing exposure is a sternal split. One routine method we use is to incise the sternum at its left lower lateral edge with a bone cutter, leaving a sliver of sternum attached to the chondral insertion (Figs 1-4). Severing of the vagi increases the oesophageal length, and with finger dissection in the region of the oesophageal hiatus a good segment of oesophagus is usually obtained (Fig. 4). The blood supply of the lower end of the oesophagus could be jeopardized by too-vigorous dissection, but one should keep in mind that the remaining transected oesophagus receives its blood supply from the thoracic aorta. Oesophageal and especially mucosal retraction can be controlled by clamping the oesophagus with a non-crushing clamp such as a Satinsky vascular clamp.

For the last 5 years we have used a simple end-to-end oesophagojejunal anastomosis using a Roux-en-Y loop with a distal jejunostomy at least 40 cm lower down to avoid alkaline reflux. The proximal limb is best brought up retrocolically. The proximal anastomosis is either done with a previously described two-layer technique<sup>36</sup> or by employing the EEA stapler with a 28 mm cartridge, which is an ideal size for this kind of anastomosis.<sup>37</sup> We seldom construct a reservoir, as these patients do very well with an ordinary Roux-en-Y oesophagojejunal anastomosis. Fig. 5 shows a patient 10 months after a total gastrectomy with a Roux-en-Y anastomosis, and Fig. 6 his barium swallow. In recent times we have used the EEA stapler more and more; it has very definite technical advantages, especially with high transection of the abdominal oesophagus.

**TABLE IV. FIVE-YEAR SURVIVAL AFTER PROXIMAL OR TOTAL GASTRECTOMY FOR CARCINOMA OF THE STOMACH**

|  | Survival rate (%) |
|--|-------------------|
| Cassell and Robinson <sup>5</sup>        | 8                 |
|  | 19,4 (P)          |
| Remine and Priestley <sup>8</sup>        | 10 (T)            |
| Burn <sup>11</sup>                       | 11 (T)            |
| Inberg <i>et al.</i> <sup>4</sup>        | 20 (T & P)        |
| Kock <i>et al.</i> <sup>39</sup>         | 17                |
| Griffith and Davis <sup>19</sup>         | 8                 |
| Gunnlångsson <i>et al.</i> <sup>23</sup> | 27 (NN)           |
|  | 7,6 (NP)          |
| Lumpkin <i>et al.</i> <sup>12</sup>      | 0 (P)             |
|  | 2 (T)             |
| McNeer <i>et al.</i> <sup>38</sup>       | 12,7              |
| Lundh <i>et al.</i> <sup>7</sup>         | 10                |
| Ellis and Gibb <sup>24</sup>             | 0*                |
| Jackson <i>et al.</i> <sup>25</sup>      | 11 (T)            |
| Hoerr <sup>14</sup>                      | 17                |
| Olearchyk <sup>15</sup>                  | 10                |
| Du Pont <i>et al.</i> <sup>1</sup>       | 2 (OG)            |
| Stone <i>et al.</i> <sup>28</sup>        | 17 (NN)           |
| Kairaluoma <i>et al.</i> <sup>16</sup>   | 6†                |
| Conti <i>et al.</i> <sup>29</sup>        | 4                 |
| Ellis <sup>35</sup>                      | 27 (NN)           |
|  | 8                 |
| Anonymous <sup>18</sup>                  | 18,5              |
| White <i>et al.</i> <sup>9</sup>         | 14,8              |
| Mean                                     | 10,54             |

\* Average survival 20,8 months.  
 † At 8 years.  
 T = total gastrectomy; P = proximal gastrectomy; NN = nodes negative; NP = nodes positive; OG = oesophagogastrectomy.

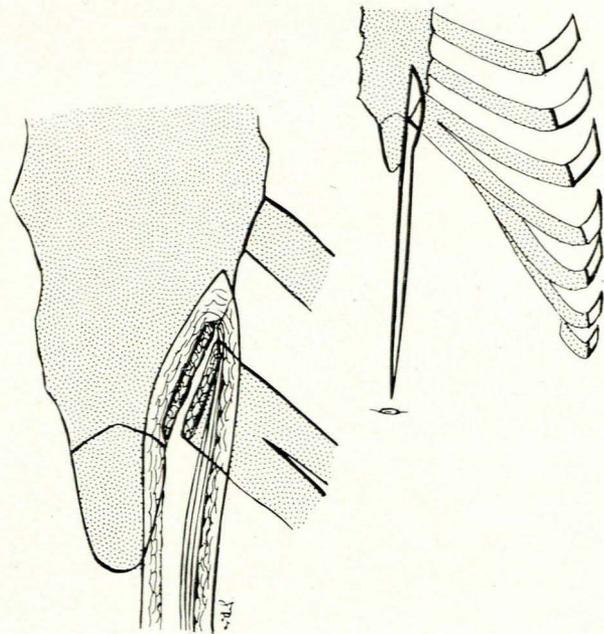


Fig. 2. A sliver of sternum with attached chondral insertion is demonstrated.

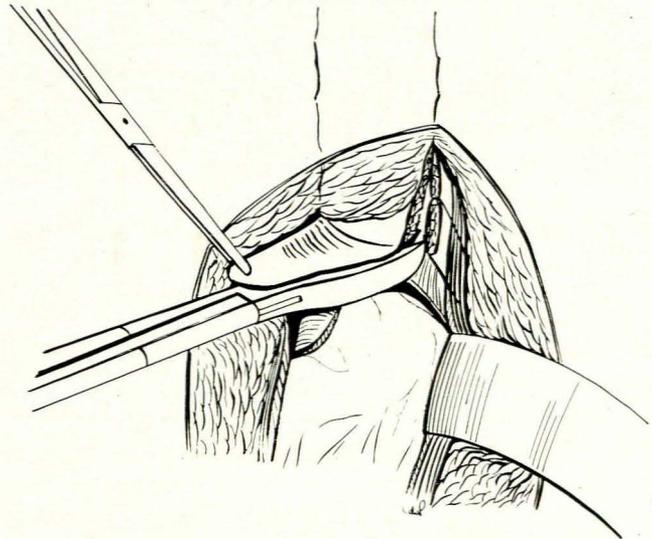


Fig. 3. The edge of the sternum is cut with bone scissors.

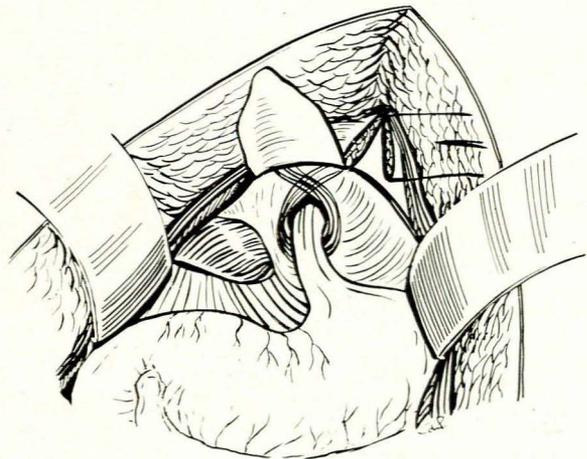


Fig. 4. The diaphragm and oesophagus in the region of the hiatus are well exposed.

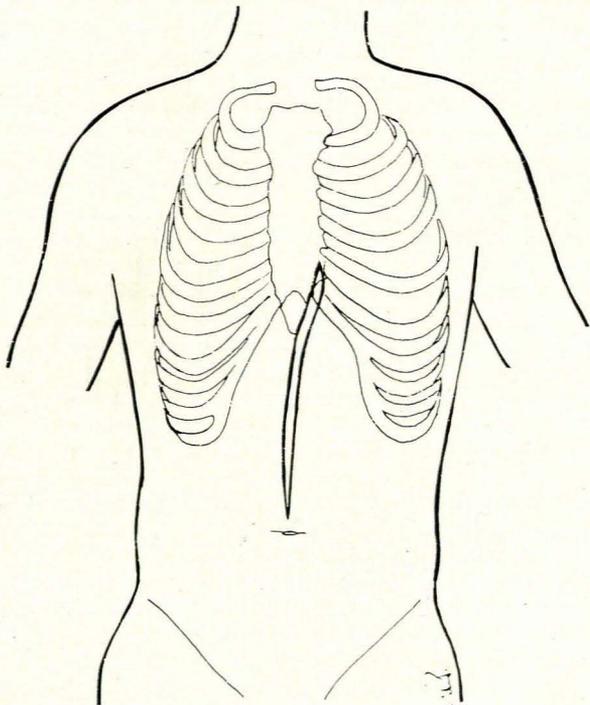


Fig. 1. The upper midline abdominal incision is extended upwards over the inferior left lateral edge of the sternum.

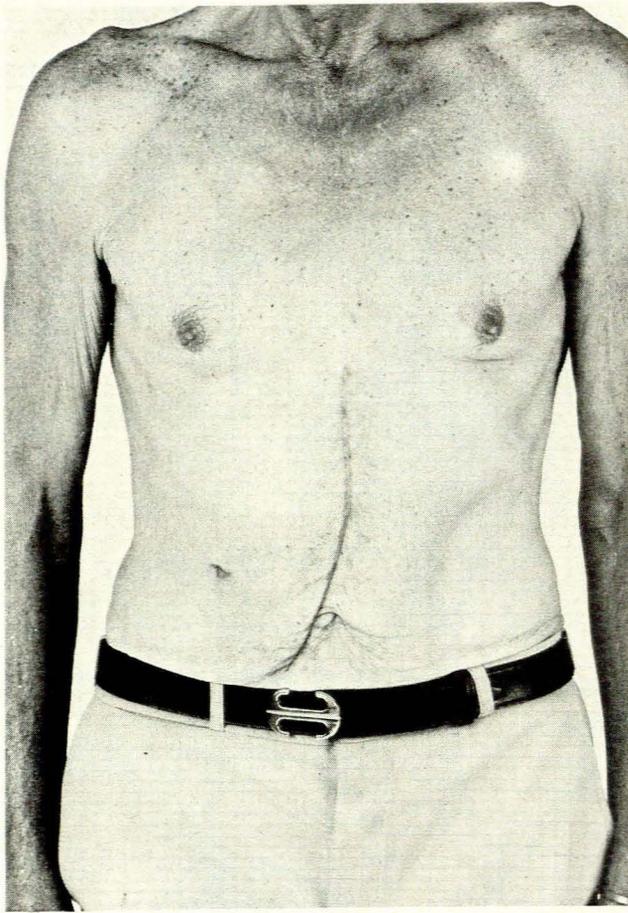


Fig. 5. A patient 10 months after total gastrectomy with a Roux-en-Y anastomosis.

## Discussion

In one-fifth of all patients with carcinoma of the stomach the site will be in the proximal region, requiring a proximal or total gastrectomy. The low incidence at this site means that this type of operation is not as commonly performed as that for distal sited carcinomas, so that the operative experience of the average surgeon is biased towards distal subtotal gastrectomy. If we take it that of every 100 carcinomas only half will be resectable, the average surgeon will have the opportunity of performing a proximal or total gastrectomy on only 10 patients out of the original 50 with tumours suitable for resection. What is more depressing is that the patient has a 60 - 70% chance of having an inoperable lesion, so that an operation for cure is performed on only 3 or 4 of the original 50 patients qualifying for resection. The operative mortality associated with proximal or total gastrectomy is depressingly high in most hands. The most common cause of death is leakage of the anastomosis, which occurs in 20 - 50% of cases. Many surgeons are of the opinion that the incidence of leakage after proximal gastrectomy is significantly higher than after total gastrectomy, and the latter procedure is therefore preferred.<sup>4,6,13</sup> The usual surgical approach is via a thoraco-abdominal incision; an anastomotic leak means a rise in the mortality rate and crippling morbidity. McNeer *et al.*<sup>38</sup> report pulmonary complications in 59 out of 94 cases and state that some of these were influenced by the left thoracotomy. In Conti *et al.*'s series<sup>29</sup> 11 out of 48 patients died after oesophagogastronomy; 7 of the 11 lethal complications occurred after a thoraco-abdominal incision. There were no deaths when the abdominal incision was used.<sup>29</sup> While it might

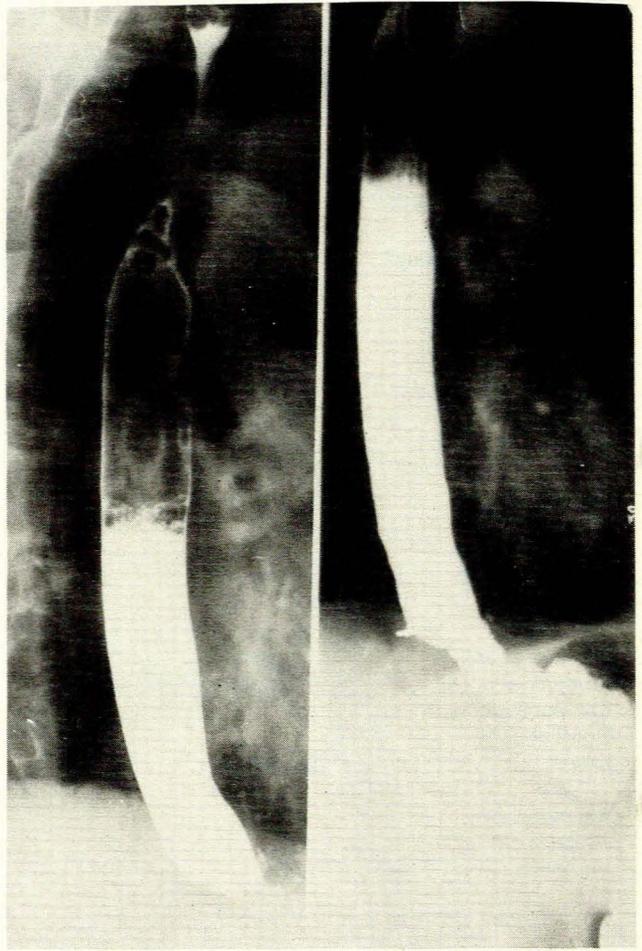


Fig. 6. The barium swallow of the patient in Fig. 5.

be postulated that a thoraco-abdominal approach will allow more extensive resection and a better chance of cure, one must honestly weigh this advantage against the increased mortality and morbidity associated with the approach. Gilbertsen's<sup>22</sup> statement that 'the employment of larger, more extensive surgical procedures has been associated with a marked increase in operative mortality as well as a significant decrease in prolonged survival' may very well be true. An anastomotic leak below the diaphragm has a good chance of sealing compared with that in the chest, where the movement of the lungs hinders such a process. In addition the high incidence of pleural effusion, empyema, septicaemia and mediastinitis is unacceptable.

While hyperalimentation, jejunostomy feeding and so on allow us to save many of these patients, by the time the cancer patient returns from a long and depressing stay in hospital his morale and that of his relatives are bound to be very low indeed. A leaking anastomosis in the subdiaphragmatic position is a serious problem, but fortunately the chance of survival is good and the leak usually heals fairly rapidly. We routinely do gastrografin swallows on the 3rd, 5th and 7th postoperative days to test the anastomosis and on one or two occasions a slight leakage has been found on the 3rd or 5th day, but this has usually disappeared by the 7th to 10th postoperative day. Fig. 7 demonstrates a fairly large leak in a patient who eventually required hyperalimentation for 1 month but did not develop a subphrenic abscess or other septic complications.

Table IV shows that the average 5-year survival is 10.5%, with at best 20% in patients with lymph nodes free of metastases. It must be remembered that most patients undergo palliative resection and that many of them live for up to 3 years relieved of

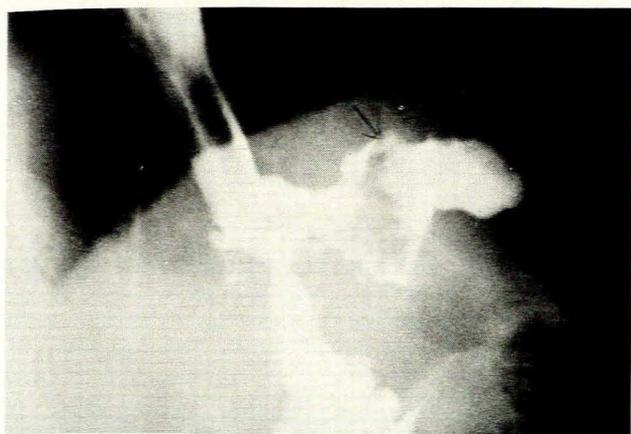


Fig. 7. A large leak demonstrated on a radiograph 10 days after a total gastrectomy with a Roux-en-Y anastomosis.

their dysphagia. Ellis<sup>35</sup> makes the point that cure is uncommon and that surgical treatment should be considered palliative,<sup>35</sup> and one must also agree with his statement that gastrostomy is very poor palliation and that an attempt at resection should be made. The chance of lymph node involvement is about 75%, which emphasizes the advanced stage of the disease in the majority of patients.<sup>5</sup> None of Lawrence and McNeer's<sup>40</sup> patients with proximal gastric cancer and lymph node metastases survived for 5 years. In spite of this gloomy picture most surgeons still feel that resection is justified by the occasional pleasant surprise of a patient living 5 years and more, although the surgeon felt that he was performing a palliative procedure.<sup>4</sup> A live patient who leaves hospital reasonably soon after the operation is certainly better than a patient who dies in hospital or one who has serious chest problems in the postoperative period.

The argument against this conservative approach is that it is necessary to resect at least 7 cm of oesophagus above the lesion if the gastro-oesophageal junction is involved. Five centimetres suffice for carcinoma of the cardia.<sup>20,21</sup> Most surgeons today have learnt to expose a good length of abdominal oesophagus because of the now popular highly selective vagotomy procedure, and once the vagi have been severed an adequate length of oesophagus above the lesion is usually found. A thoraco-abdominal incision is still justified in certain cases, however, and it should be used if 'shifting' the lesion is difficult or if it is certain that an operation for cure can be performed.

## Conclusions

Of all cases of carcinoma of the stomach about 20% will be in the

proximal region of the stomach and half of these will be resectable; one-sixth of patients will die as a result of the operation and only 1 out of 10 will survive for 5 years. To my mind these depressing facts strengthen my plea for a subdiaphragmatic approach to these carcinomas. We have been using it for the last 3 years; among the 16 cases there was 1 non-fatal anastomotic leakage and 1 postoperative death due to a missed tension pneumothorax.

I wish to thank Mrs Cynthia du Plooy of the Department of Medical Illustration, Division of Didactics, Stellenbosch University, for the illustrations.

## REFERENCES

- Du Pont, J. B., Lee, J. R., Burton, G. R. *et al.* (1978): *Cancer*, **41**, 941.
- Deamesti, F. and Otaiza, E. (1948): *Surgery*, **23**, 921.
- Cady, B. and Choe, D. S. (1976): Abstracts, 3rd International Symposium on Detection and Prevention of Cancer, p. 413.
- Inberg, M. V., Heinonen, R., Rantakokko, V. *et al.* (1975): *Arch. Surg.*, **1110**, 703.
- Cassell, P. and Robinson, J. O. (1976): *Brit. J. Surg.*, **63**, 603.
- Paulino, F. and Roselli, A. (1973): *Curr. Probl. Surg.*, December, p. 14.
- Lundh, G., Burn, G. I., Golig, G. *et al.* (1974): *Ann. roy. Coll. Surg. Engl.*, **54**, 219.
- Remine, W. H. and Priestley, J. T. (1966): *Ann. Surg.*, **163**, 736.
- White, R. R., Mackey, J. A. and Fitts, W. T. (1975): *Ibid.*, **181**, 611.
- Fenn, A. S., Job, C. K., Bhat, H. S. *et al.* (1964): *Indian J. Surg.*, **26**, 327.
- Burn, J. I. (1971): *Brit. J. Surg.*, **58**, 798.
- Lumpkin, W. M., Crow, R. L., Hernandez, C. M. *et al.* (1964): *Ann. Surg.*, **159**, 919.
- Fujimaku, M., Sosa, J. and Wada, K. (1972): *Cancer*, **30**, 660.
- Hoerr, S. O. (1978): *Curr. Surg.*, **35**, 380.
- Olearchyk, A. S. (1978): *Amer. J. Gastroent.*, **70**, 25.
- Kairaluoma, M. I., Karkola, P., Jokinen, K. *et al.* (1977): *Ann. Chir. Gynaec. Fenn.*, **66**, 8.
- Tonnesen, K., Fischerman, K., Norgaard, T. *et al.* (1976): *Scand. J. Gastroent.*, **37**, suppl., pp. 107 - 110.
- Anonymous (1975): *Chin. med. J.*, **1**, 60.
- Griffith, J. L. and Davis, T. (1980): *J. thorac. cardiovasc. Surg.*, **79**, 447.
- Gavriliu, D., Anghel, I., Dumitruscu, G. *et al.* (1977): *Chir. gastroent.*, **11**, 308.
- Desmond, A. M. (1976): *Proc. roy. Soc. Med.*, **69**, 867.
- Gilbertsen, W. A. (1969): *Cancer*, **23**, 1305.
- Gunnlangsson, G. H., Wychulis, A. R., Roland, C. *et al.* (1970): *Surg. Gynec. Obstet.*, **130**, 997.
- Ellis, F. H. and Gibb, S. P. (1979): *Ann. Surg.*, **190**, 699.
- Jackson, J. W., Cooper, D. K., Guvendik, L. *et al.* (1979): *Brit. J. Surg.*, **66**, 98.
- Kummerle, F. (1978): *Chir. gastroent.*, **12**, 21.
- Gatzinsky, P., Bergh, N. P., Dernevik, L. *et al.* (1977): *Acta chir. scand.*, **143**, 341.
- Stone, R., Rangel, D. M., Gordon, H. E. *et al.* (1977): *Amer. J. Surg.*, **134**, 70.
- Conti, S., West, J. P. and Fitzpatrick, H. F. (1977): *Amer. Surg.*, **43**, 92.
- Orel, J. (1975): *Bull. Soc. int. Chir.*, **34**, 373.
- Teitler, R. F., Painter, R. W. and Foster, J. H. (1975): *Amer. J. Surg.*, **129**, 89.
- Smith, R. A. (1974): *Brit. J. Surg.*, **61**, 524.
- Dillon, M. L., Mobin-Uddin, K., Utley, J. R. *et al.* (1974): *J. thorac. cardiovasc. Surg.*, **68**, 321.
- Leverment, J. N. and Milne, D. M. (1974): *Brit. J. Surg.*, **61**, 683.
- Ellis, F. H. (1976): *Surg. Clin. N. Amer.*, **56**, 571.
- Van Rensburg, L. C. J. (1979): *S. Afr. med. J.*, **56**, 173.
- Van Rensburg, L. C. J., Malherbe, E. B., Marais, I. P. *et al.* (1981): *S. Afr. J. Surg.*, **19**, 43.
- McNeer, G., Bowden, L., Boher, R. J. *et al.* (1974): *Ann. Surg.*, **180**, 252.
- Kock, N. G., Lewin, E. and Petterson, S. (1969): *Acta chir. scand.*, **135**, 340.
- Lawrence, W. and McNeer, G. (1960): *Surg. Gynec. Obstet.*, **111**, 691.