The Paulino Thoracoplasty

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At the annual meeting of the American Association for thoracic surgery at Dallas in 1952, Dr. Paul T. DeCamp and Associates read “A Paper on Suture Constriction of the Lung and Partial Thoracoplasty.” More recently they have reviewed their four year experience with this procedure. This paper describes our experience with the operation at Tranquille Sanatorium over an 18 month period, during which it was performed on 35 patients. The procedure was devised by Dr. Fernando Paulino, Rio de Janeiro.5,4

The operation consists of removal of the second, third and fourth ribs in decreasing lengths from above downwards, followed by complete apicolysis (Fig. 1). The liberated apex of the lung containing the disease is then constricted by a series (usually three) of purse string sutures placed round it from above downwards. The apex is held in a curved clamp during the insertion of the sutures of No. 4 black silk or No. 10 crochet cotton. It is essential that the sutures should pass through both parietal and visceral pleura in order to prevent the lung from slipping downwards should a free pleural space exist. The extra-periosteal pneumolysis is carried to below the level of the diseased area; this may be to the level of the hilum on the mediastinal aspect and as low as the seventh interspace posterolaterally. Where the disease extends downwards, possibly into the superior segment of the lower lobe, we remove in addition, the posterior half of the fifth rib. In only one case has this resulted in a slipping scapula.

We favour the Paulino thoracoplasty because it is the procedure which fulfills most completely the requirements of the ideal collapse operation. These may be listed as follows:

1. The operation is applicable to cases of far advanced and bilateral tuberculosis.
2. There is only one stage.
3. No foreign material is introduced.
4. There is minimal deformity. The scapula remains outside the ribs.
5. There is maximum preservation of function.
6. The operation is safe. There are few post-operative complications.

In short, the operation gives permanent, selective, concentric collapse without the use of plombage material and without collapsing the disease onto mobile, elastic, active lung.

The following history (Case 1) is that of our first patient subjected to the operation.

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Case 1: This 42 year old white prostitute was admitted with bilateral far advanced disease. After 13 months of antibiotic treatment, there remained diffuse infiltration and a 3 cm cavity on the right side and a 1.5 cm solid lesion on the left (Figs. 2 and 3). A right Paulino thoracoplasty was performed, the first four and one-half ribs being removed (after the first five cases the first rib was left in situ). The early (Fig. 4) and ninth month (Fig. 5) post-operative x-ray film appearances are shown. Sputum conversion has been maintained now for two years. It is not known if she has returned to full time work. She refuses surgery for the left side.

Material.

Since May 1953 we have applied the procedure 35 times with gratifying results in 33 cases. The series includes 15 women and 20 men. Ages range from 21 to 59 years.

Extent of Disease.

<table>
<thead>
<tr>
<th>Extent of Disease</th>
<th>Per Cent</th>
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</thead>
<tbody>
<tr>
<td>Far advanced</td>
<td>25.6</td>
</tr>
<tr>
<td>Moderately advanced</td>
<td>54.4</td>
</tr>
<tr>
<td>Minimal</td>
<td>20.0</td>
</tr>
<tr>
<td>Bilateral</td>
<td>51.4</td>
</tr>
<tr>
<td>Unilateral</td>
<td>48.6</td>
</tr>
</tbody>
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FIGURE 1: Technique of Paulino procedure (reproduced from Am. Review of Tuberculosis, July, 1954, by permission of Editor and authors of "Suture Ligation of Lung and Partial Thoracoplasty").
Chemotherapy.

Almost all the patients had streptomycin and para-aminosalicylic acid, with or without isoniazid, for at least five months pre-operatively. Thus, many were already sputum negative on direct smear. In nearly every case antibiotics were discontinued two months post-operatively. The rationale being that tuberculosis heals by closure of the bronchocavitary junction and antibiotics would maintain the patency of the channels from the lesion to the exterior. In addition, the effectiveness of the collapse can only be assessed early in this way. This opinion is firmly subscribed to by Dr. Norman Wilson, who discontinues antibiotics as early as one week following a plombage thoracoplasty. The exception to this rule occurs when there is potentially active contralateral disease which has not been sufficiently controlled by antibiotics pre-operatively.

Results.

There has been no operative death in this series. One patient, a 38 year old half-breed woman, with far advanced bilateral disease and cavities in all five lobes, died one month post-operatively from exacerbation of the disease. The only other major complication occurred when a 54 year old, frail Chinese male developed contralateral spread and later broncho extrapleural fistula. He is responding to drainage and further chemotherapy. The remaining 33 are well; 26 of them are at home, sputum negative on
FIGURE 4
Figure 4—Case 1: Appearance 12 days following right Paulino thoracoplasty, ribs 1-5.

FIGURE 5
Figure 5—Case 1: Appearance nine months following right Paulino thoracoplasty.

culture six months upwards post-operatively. Of the eight now convalescing two have had additional surgery for contralateral disease, one a resection, the other a second Paulino thoracoplasty. Two are still sputum positive on smear. One requires resection of the collapsed disease. The other has the fistula referred to above.

FIGURE 6
Figure 6—Case 2: Right thoracoplasty (four stages) fifteen years, new cavitated disease behind inner end left clavicle. 

FIGURE 7
Figure 7—Case 2: Left apical planogram showing cavity.
Complications.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Excessive extra-pleural fluid</td>
<td>1</td>
</tr>
<tr>
<td>2. Intra-pleural fluid</td>
<td>2)</td>
</tr>
<tr>
<td>without tear</td>
<td>2)</td>
</tr>
<tr>
<td>with tear</td>
<td>4</td>
</tr>
<tr>
<td>3. Infection of extra-periosteal space plus fistula</td>
<td>1</td>
</tr>
<tr>
<td>4. Exacerbation of tuberculosis (&amp; death)</td>
<td>1</td>
</tr>
<tr>
<td>5. Contralateral spread of disease (same case as 3)</td>
<td>1</td>
</tr>
<tr>
<td>6. Slipping scapula</td>
<td>1</td>
</tr>
<tr>
<td>7. Phrenic nerve damage</td>
<td>1</td>
</tr>
</tbody>
</table>

In summary, nine patients had complications:
(a) Major: two cases, one death, one spread and fistula
(b) Minor: seven cases

The excessive extra-periosteal fluid was removed in one because of dyspnoea. There was an extensive contralateral thoracoplasty and pulmonary function was impaired. This compares favourably with the regime in plombage thoracoplasty. At the Overholt Clinic such aspiration is routine, at least once.

Case 2: This 39 year old white housewife had a four-stage right thoracoplasty 15 years prior to admission to our sanatorium in 1953. There was new cavitated disease at the left apex (Figs. 6 and 7). After 12 months of antibiotics a left Paulino thoracoplasty was performed. Portions of the second, third, fourth and fifth ribs were removed. Fluid was aspirated once from the left extra-periosteal space to relieve dyspnoea.

FIGURE 8
Figure 8—Case 2: Appearance eleven days following left Paulino thoracoplasty, ribs 2-5.

FIGURE 9
Figure 9—Case 2: Appearance six months following Paulino thoracoplasty.
Figure 10—Case 3: Preoperative film. Former bilateral pneumothorax. Cavity right apex. Figure 11—Case 3: Right apical planogram showing 3 cm. cavity and thickened pleura. Figure 12—Case 3: Appearance one year following right Paulino thoracoplasty, ribs 2-6.
The 11th day post-operative x-ray film showed still a large extra-periosteal collection of fluid (Fig. 8) but after six months (Fig. 9) a satisfactory collapse was maintained. The maximum breathing capacity, meanwhile was 62.8 litres per minute, having been 76.7 litres per minute, pre-operatively. She is well and doing part-time work one year following surgery.

Intrapleural fluid developed in two cases without pleural tear having been noted. We believe with Dr. Wilson 4 that this is due to irritation by, or pressure from the extra-periosteal fluid through the thin anterior pleura.

Paroxysmal respiration has not been a troublesome feature in this series.

Case 3: A 87 year old white logger was presented for surgery with a five year history of pulmonary tuberculosis. Bilateral pneumothorax had been given for two years and discontinued for three years. A large cavity remained at the right apex, under a thickened pleura following hydro-pneumothorax (Figs. 10 and 11). Resection was the preferred treatment here. At operation a dense pleura, 1 cm. thick, was encountered over the whole of the lateral surface of the lung. To have done lobectomy would have required a long tedious operation with complete decortication of the lung. There was quite a strong possibility that pneumonectomy might be necessary. It was decided that a Paulino thoracoplasty was worth a trial. Soft pleura was encountered on the mediastinal surface and in spite of the thickness elsewhere, the apex was satisfactorily collapsed. Sputum conversion was quickly obtained. Because of the original intention to perform lobectomy this patient was operated upon in the face down position. No difficulty of access was encountered. He was back at heavy work one year post-operatively, and remains well six months later. Fig. 12 shows the final situation. The additional ribs were removed in connection with the planned resection.

Indications.

These are:

(a) General, where from a study of the course of the disease it is decided that some form of surgical assistance is necessary.

(b) Special, in which the thorny problem of collapse versus resection is raised.

Figure 13—Case 4: Appearance at time of first admission to hospital. Figure 14—Case 4: After 23 months antibiotic therapy, a giant cavity remains in left apex, and a moderate amount of disease in the right.
Figure 15—Case 4: Planogram, showing bilateral cavitated disease.

Figure 16—Case 4: Five weeks following left Paulino thoracoplasty, ribs 2-5.
Generally speaking, the operation was reserved initially for cases unsuitable for resection.

Case 1: This 25 year old white female, an alcoholic and borderline prostitute, was first diagnosed in 1948 with a minimal left upper lobe lesion. She did not attend for follow-up x-ray films until 1952 when far advanced bilateral disease was present (Fig. 13). She stayed in hospital for 11 months' antibiotic treatment, then signed out for five months. After 12 months' further antibiotic administration (Figs. 14 and 15) it was decided to attempt closure of the giant cavity in the left apex. Four-rib Paulino thoracoplasty was performed, and in spite of the low maximum breathing capacity of 39 litres/minute, was well tolerated. Five weeks post-operatively (Fig. 16) the amount of collapse appeared satisfactory. Eight weeks post-operatively she signed out again. She had been sputum negative on smear for about nine months at this time.

The indications are widening as results continue to give satisfaction. Now the operation is always considered where no solid lesion is present. It is a safer and much shorter procedure than resection. The factors of age, marginal respiratory reserve and general debility, favour its selection. Where resection of a lobe with a space reducing thoracoplasty is envisaged, many patients prefer to try the thoracoplasty first, especially when so hopeful an outcome can be promised at the expense of such a minimal removal of ribs. So far it has not been necessary to resect under a Paulino thoracoplasty. Doctors DeCamp and Acree do not mention this necessity either in their review of 42 similar operations, but Dr. Acree has described to me two cases of resection which he has done subsequently. He encountered no difficulty whatsoever from the constricting sutures.

It is evident that this operation has a definite place in the armamentarium of the thoracic surgeon. As a prophylactic it is much less radical than resection of the residual, when the residual is not a clear cut, solid lesion. Indications for the Paulino thoracoplasty may well further widen as does our experience with the procedure.

Acknowledgments: It is a pleasure to record the excellent co-operation of the medical and nursing staff of Tranquille Sanatorium. The low incidence of post-operative complications is also a tribute to our anaesthetist, Dr. I. G. Smillie of the Burris Clinic, Kamloops, who gave all the anaesthetics. I am also indebted to the Division of Tuberculosis Control of British Columbia for assistance in the preparation of this paper.

Addendum: At the date of publication, one further patient (the one with spread and broncho-pleural fistula) has died. The two sputum positive patients have had their disease resected without difficulty.

SUMMARY

1. Experience of suture constriction of the lung with partial thoracoplasty (Paulino Procedure) in 35 cases is described.
2. This one stage operation gives permanent, selective, concentric collapse with minimal costal resection, and without the introduction of foreign (plombage) material.
3. The operation is safe with few post-operative complications and causes little function loss.
4. It is applicable to cases of far advanced and bilateral tuberculosis.
5. Six months after the last operation, 31 patients are well and sputum negative on culture, three have positive sputum (two of these require resection); one has died.

RESUMEN

1. Se describe la experiencia con la sutura constrictiva del pulmón combinada con toracoplastía parcial (procedimiento de Paulino) en 35 casos.
2. Esta operación en un tiempo, da un colapso concéntrico, permanente selectivo con un mínimo de resección costal y sin la introducción de plom- baje de cuerpo extraño.

3. La operación es segura con pocas complicaciones postoperatorias y causa pequeña pérdida de función.

4. Es aplicable a casos de tuberculosis muy avanzada y bilateral.

5. Seis meses después de la última operación 31 enfermos estaban y con esputos negativos al cultivo; tres tienen esputos positivos (dos de estos requieren resección); uno ha muerto.

RESUME

1. L’auteur décrit la suture constrictive du poumon associée à une thora- coplastie partielle (méthode Paulino) qu’il a pratiquée dans 35 cas.

2. Ce premier temps d’opération donne un collapsus concentrique per- manent, électif, avec un minimum de résection costale, et sans l’introduc- tion de corps étrangers (plombage).

3. L’opération est sans danger, occasionne peu de complications post- opératoires et ne cause qu’un léger déficit de la fonction pulmonaire.

4. Elle convient aux cas de tuberculose avancée et bilatérale.

5. Six mois après le dernier temps opératoire, 31 malades étaient en bon état, avaient des crachats négatifs à la culture; trois avaient des crachats positifs, deux d’entre eux durent subir une résection. L’un mourut.

ZUSAMMENFASSUNG


4. Sie lässt sich anwenden bei Fällen weit fortgeschritener und beid- seitiger Tuberkulose.

5. 6 Monate nach der letzten Operation waren 31 Kranken wohlauflauf und im Sputum kulturell negativ; 3 haben ein positives Sputum (2 von diesen benötigen eine Resektion); 1 ist verstorben.

REFERENCES


5 Wilson, N. J., Personal Communication.

6 Wilson, N. J., Personal Communication.

7 Acree, P. W., Personal Communication.