# POST-CRICOID CARCINOMA

By RONALD W. RAVEN (London)

RADICAL surgical operations designed upon an accurate knowledge of the pathology of the disease have an assured place in the treatment of carcinoma of the hypopharynx. For many patients it is the only treatment with the prospect of cure which can be offered to them. Whilst this applies to carcinoma in other parts of the hypopharynx, it is especially relevant to the post-cricoid region. My experience has convinced me that whenever possible a radical surgical operation should be carried out for these patients.

## Definition

The post-cricoid area is the part of the anterior wall of the hypopharynx which corresponds to the broad quadrilateral posterior half of the cricoid cartilage. This is covered by the crico-arytenoideus posticus muscle and the mucous membrane of the pharynx. A carcinoma commences in this area and in the posterior wall of the hypopharynx opposite to it. These tumours involve the pharyngo-œsophageal junction which they may surround. A carcinoma which arises in other parts of the hypopharynx such as the pyriform fossa and arytenoid region may extend downwards into the pharyngo-œsophageal region and present the same treatment problems as the primary post-cricoid carcinoma. In this discussion I will consider those carcinomas which involve the post-cricoid and pharyngo-œsophageal regions and exclude such tumours as those confined to the pyriform fossa and arytenoid areas.

## Special Features

*The Paterson- Kelly Syndrome.* Mention is made of this precancerous condition in the post-cricoid region. Changes occur in the mucous membrane and submucosa leading to webs, bands and strictures. The condition is a chronic iron-deficiency state and other deficiencies, especially of vitamins B and C, may be present. An impassable stricture may form necessitating surgical treatment, and I have performed a resection of the pharyngo-œsophageal region with an immediate end-to-end pharyngo-œsophageal anastomosis for such a condition. This may be a preventive operation for post-cricoid carcinoma in these cases.



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## Prognosis

The prognosis of carcinoma involving the pharyngo œsophageal junction treated by irradiation is bad and few patients have survived for five years. I feel it is essential that radical surgical treatment should be given an extended trial in these cases so that the end-results can be evaluated in an adequate series of cases over a period of 5 years. The results which have been achieved by surgery fully justify this attitude.

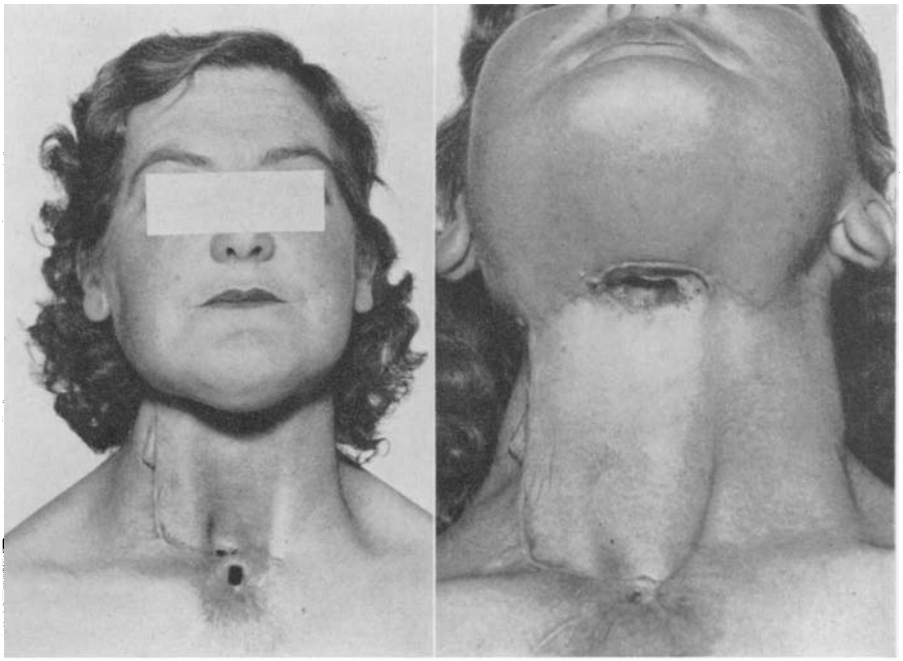


FIG. 1. FIG. 2.

FIG. 1.

Photograph of a patient at the end of the first stage of laryngo-œsophago-pharyngectomy for post-cricoid carcinoma showing the œsophagostomy separated by a bridge of skin from the tracheostomy.

FIG. 2.

Photograph of the same patient as in Fig. 1 to show the pharyngostomy.

## Pathology in Relation to Radical Surgery

In some cases carcinoma in the hypopharynx is of multifocal origin. The tumour infiltrates in area and in depth in the pharyngeal wall so that other parts of the hypopharynx and structures in its vicinity are invaded. Upward spread occurs to the epiglottis and oropharynx and downward extension into the cervical œsophagus is common. Anteriorly infiltration into the larynx occurs and in an appreciable number of cases the wall of the



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trachea is penetrated. In many cases there is direct spread into the lateral lobes of the thyroid gland and the internal jugular vein is frequently invaded and drawn anterior to the common carotid artery and becomes adherent to the pharyngeal wall.

Metastases are frequent in the regional lymph nodes. They form initially in the group of lymph nodes lying in close proximity to the internal jugular vein between the posterior belly of the digastric and the anterior belly of the omohyoid muscles; these nodes receive lymph from

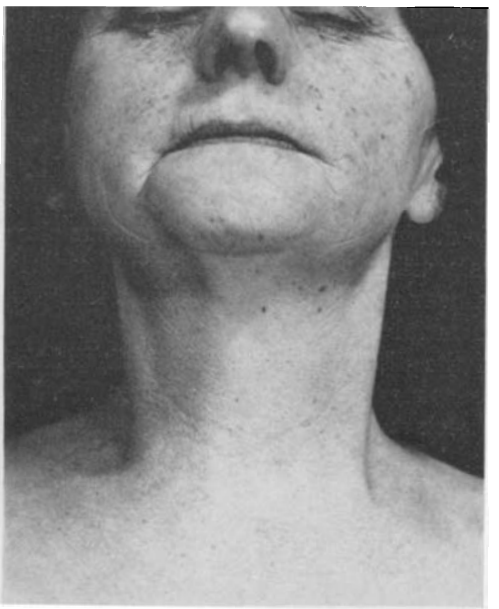


FIG. 3.
Photograph of a patient, aged 61, with a large post-cricoid carcinoma.

the hypopharynx through the supraglottic pedicle. When the tumour is limited to one-half of the hypopharynx the lymph nodes in both sides of the neck may nevertheless be affected. These lymph nodes communicate with those lying along the spinal accessory nerve as far as the anterior border of the trapezius muscle and with others lying below the omohyoid muscle as far as the supra-clavicular region.

A carcinoma in the post-cricoid region and cervical œsophagus causes metastases in the lymph nodes lying along the recurrent laryngeal nerves. When the larynx is infiltrated metastases may be found in the pre-laryngeal and pretracheal lymph nodes as well as in the perithyroidean lymphatics.



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Ronald W. Raven

A radical operation for a carcinoma in the hypopharynx must be planned and executed to include the removal of all the actual and potential affected tissues in the neck.

## Operability

The selection of patients for operation is an onerous responsibility; when they are considered inoperable it is usually a death sentence. Alternatively a patient must not be submitted to radical surgical treatment when this is likely to leave him in a worse position later with an early recurrence or spreading carcinoma with the disadvantages of the presence of a pharyngostomy or œsophagostomy.

## Clinical Assessment

The patient's physical condition must be suitable to withstand two major operations, and the cardiovascular, respiratory and urinary systems are assessed. Nutritional and blood deficiencies are estimated and corrected as far as possible. After a full course of radiotherapy the general condition is often poor and technical problems relating to the repair and healing of wounds must be solved.

The extent of the disease is assessed. Fixity of the hypopharynx or cervical lymph nodes renders the disease inoperable. In some patients the structures of the neck are incorporated as a malignant mass. Pharyngoscopy shows the level of upward extension which may reach the lower part of the oropharynx but the disease can still be removed. It is difficult to determine the extent of spread into the cervical œsophagus as an œsophagoscope cannot be passed in many cases. Information is provided by a radiological examination on swallowing barium and by tomograms which also give an indication of the general extent of the tumour.

When a post-cricoid carcinoma has spread into the thoracic œsophagus operation may still be possible by an extension of the laryngo-œsophago-pharyngectomy operation which includes excision of the manubrium sterni. The final decision whether the œsophageal extension precludes operation is usually made on exploration of the neck.

A lateral X-ray of the neck demonstrates the degree of involvement of the retro-pharyngo-œsophageal tissues and of the cervico-dorsal vertebrae.

## Operative Assessment

The first stage in the radical operation is to determine the exact boundaries of the disease by inspection, palpation and the removal of tissues for immediate histological examination. The quadrilateral flap is raised and a thorough exploration of the neck is carried out. This includes an assess-



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ment of the extent of lateral spread by direct extension; involvement of the common or internal carotid arteries by the pharyngeal carcinoma renders it inoperable. A decision is made whether it is necessary to include a radical dissection of the cervical lymph nodes and on which side. The recurrent laryngeal lymph nodes are exposed on both sides and those in the supra-glottic pedicle. An immediate histological examination will determine the presence of metastases in the largest of these nodes. The jugulo-digastric lymph nodes are also critically examined.

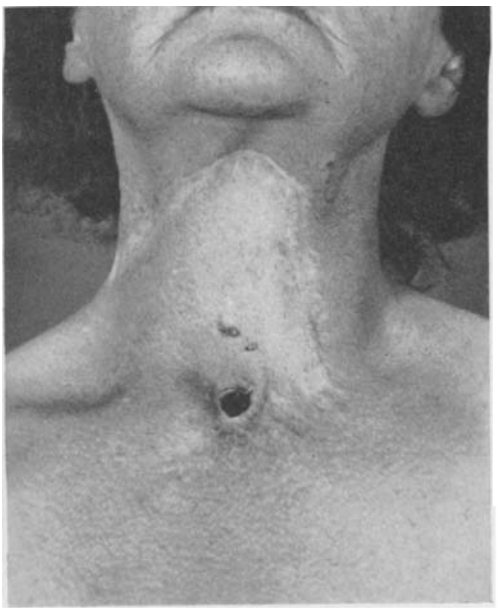


FIG. 4.

Photograph of the same patient as in Fig. 3 after laryngo-œsophago-pharyngectomy in two stages. Patient is well without recurrence 6 years 5 months later

A radical block dissection must be done on the side which is more affected; when the lymph nodes on the other side are affected they must all be dissected out in the positions mentioned but the internal jugular vein is conserved.

The cervical œsophagus is exposed as far as the superior thoracic aperture and the lower level of the carcinoma is determined by palpation. When the œsophagus is divided later an immediate histological examination is made to be certain that the line of section has cleared the tumour edge. The same applies to the division of the upper end of the hypopharynx.



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### Choice of Operation

Three operations are considered for post-cricoid carcinoma. Partial œsophago-pharyngectomy with conservation of the larynx was done for one patient and a skin hypopharynx was constructed and anastomosed to the oropharynx above and the œsophagus below. The functional result was bad and the patient died with a recurrence after one year. This operation



FIG. 5.

X-ray on swallowing barium of the new skin hypopharynx and cervical œsophagus of the same patient as in Fig. 3. Antero-posterior view.

is not sufficiently radical and I do not advise conservation of the larynx in these cases. Sometimes a one-stage laryngo-œsophago-pharyngectomy can be performed with an immediate end-to-end anastomosis between the divided hypopharynx and œsophagus. This is an advantage because primary healing of the neck is obtained, but the anastomosis must not be done under tension.

The best operation for post-cricoid carcinoma in my experience is a



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radical two-stage laryngo-œsophago-pharyngectomy performed as a nonoblock operation to include all the affected regional lymph nodes.

**Laryngo-œsophago-pharyngectomy in two stages. Technical considerations.**

I will stress those which I have found in my work to be important.

Excision of affected regional lymph nodes: a radical lymphatic dissection is performed on the side most affected and the dissection extends from the tip of the mastoid process above to the clavicle below, and from the anterior border of the trapezius muscle inwards. The internal jugular vein is approached posteriorly and ligated first near the base of the skull and then below above the clavicle. It is then dissected from the carotid sheath and left attached with the lymph nodes, sternomastoid muscles and the other tissues to the hypopharynx. The affected lymph nodes are dissected from the opposite side from without inwards and left attached to the hypopharynx.

The chain of lymph nodes lying along the recurrent laryngeal nerve are dissected out of the thoracic inlet on both sides and left attached to the pharyngo-œsophageal junction.

*Division of the pharynx and œsophagus.* In all cases the pharynx is divided above the hyoid bone and the latter is removed with the hypopharynx. The line of section must be at least 2·5 cm. above the upper limit of the carcinoma; when doubt exists regarding clearance of the tumour a histological examination of the divided pharynx by the frozen section technique is made. In cases with extensive upward spread of the carcinoma the section may pass through the middle part of the oropharynx near the base of the tongue. The mucous membrane is then reflected off the back of the tongue and sutured to the submaxillary skin to form the anterior wall of the pharyngostomy. The œsophagus is divided as low as possible in the thoracic inlet. The cut end of the œsophagus is examined histologically by the frozen section technique to ensure perfect clearance of the tumour.

*Total thyroidectomy.* This is performed in every case, for tumour spread by direct extension into the gland is frequent and the perithyroidean lymphatic plexus is connected with the lymph nodes draining the post-cricoid region and the cervical œsophagus.

*Formation of the tracheostomy and œsophagostomy.* A quadrilateral pedicle flap of skin based on the inner end of the right clavicle is raised from the anterior aspect of the manubrium sterni and transposed to lie between the tracheostomy and œsophagostomy. The anterior edge of this skin flap is sutured to the posterior wall of the trachea; the anterior wall of the latter is sutured to the skin over the manubrium sterni. The anterior wall of the divided œsophagus is sutured to the posterior edge of the transposed skin flap, and the posterior wall of the divided œsophagus is sutured to the lower border of the main quadrilateral skin flap.



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*Formation of the pharyngostomy*. The anterior and posterior walls of the divided oropharynx laterally are sutured to diminish its diameter. The posterior wall of the divided oropharynx is sutured to the upper border of the quadrilateral skin flap; the anterior wall of the divided oropharynx or the mucous membrane reflected from the back of the tongue is sutured to the skin in the submandibular region.

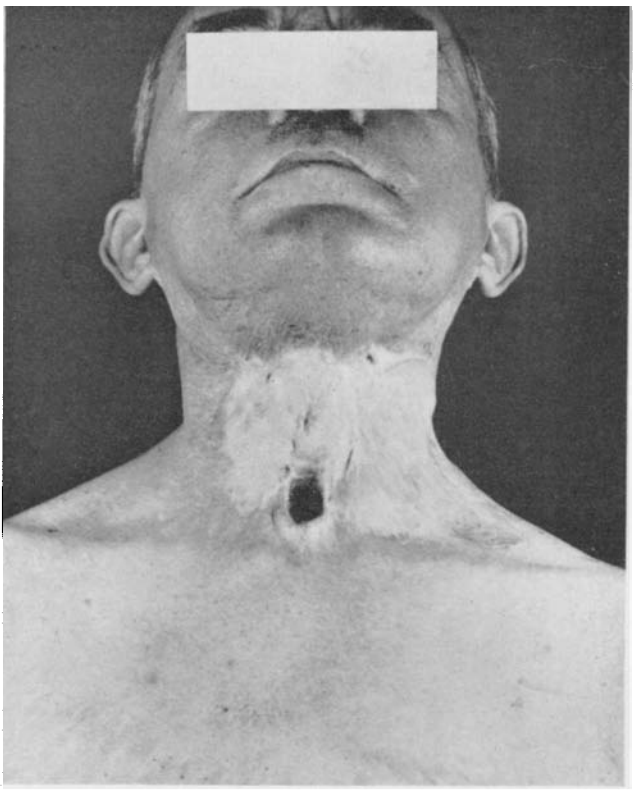


FIG. 6.

Photograph of a patient, age 65, after completion of laryngo-œsophago-pharyngectomy in multiple stages for an advanced carcinoma of the hypopharynx uncontrolled by radiotherapy and which required a palliative tracheotomy. Patient is well without recurrence 6 years 5 months later.

The free edge of the quadrilateral skin flap is sutured to the skin of the opposite side of the neck.

*Interval between the operation stages*. I usually allow an interval of eight weeks to elapse before the pharynx is reconstructed so that the skin to be used for this purpose acquires an adequate blood supply from the prevertebral region.

*Reconstruction of skin pharynx and cervical œsophagus*. The following technical points are important. An incision is made through the healed



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longitudinal incision in the neck from the oropharynx to the side of the tracheostomy, and a second incision is made on the opposite side of the neck. These incisions are convergent and the outer parts of the new pharyngeal wall are reflected inwards so as to form a tube. The anterior wall of the pharyngostomy is separated from the skin of the submandibular region and sutured to the upper edges of the new skin tube.

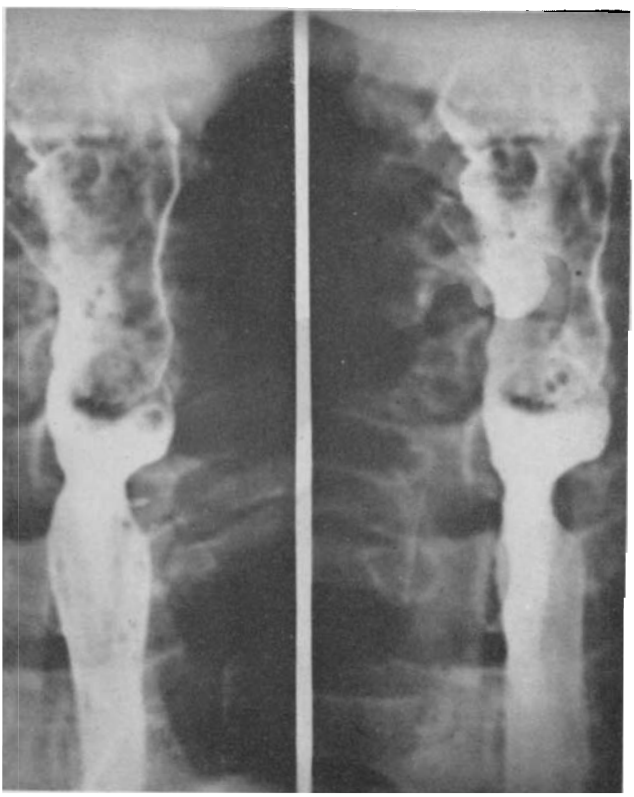


FIG. 7.

X-ray on swallowing barium of the new skin hypopharynx and cervical œsophagus of the same patient as in Fig. 6.

The œsophagostomy is separated from the tracheostomy by dividing the skin joining the posterior wall of the latter structure. The skin flaps are then mobilized and sutured together and the rest of the anterior wall of the new skin pharynx is closed by interrupted sutures.

*Skin cover for new skin hypopharynx and cervical œsophagus.* A flap of skin is reflected from the postero-lateral aspect of the neck to cover the new skin pharynx and œsophagus. This is based on the occipito-mastoid region. Any raw area left is covered by a split-thickness skin graft.



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Ronald W. Raven

## Radical Surgery following Radiotherapy

The vitality of the tissues of the neck are often impaired by a full course of radiotherapy and difficult technical problems are created when radical surgery is required for an uncontrolled carcinoma in the post-cricoid area. I have found the following techniques of value in dealing with these patients.

*Ensure viability of the quadrilateral skin flap which is required for the posterior wall of the skin hypopharynx and cervical œsophagus.* The flap must be fashioned as narrow as possible and not reflected off the sterno-mastoid muscle at its base. It is essential to achieve good vitality of this posterior wall and primary healing of the anastomosis.

*Obtain cover for the carotid arteries.* As radio-necrosis of the skin and superficial tissues may occur, the wall of the carotid arteries, which may be already weakened, must be protected. On one side the remaining sterno-mastoid muscle is sutured to the prevertebral tissues and provides good cover. It may be possible to conserve the other sternomastoid for the same purpose and this should be done whenever possible otherwise an area of radio-necrosis may occur over it and fatal hæmorrhage can result. Adequate skin cover for the carotid arteries must always be provided.

*Provision of skin for the anterior wall of the new skin hypopharynx and cervical œsophagus.* This is obtained from the anterior chest wall by acromio-pectoral tubed pedicle grafts which are transplanted in stages to the neck. The condition of the skin and other structures in the neck improves when an additional blood supply is furnished by the tubed skin grafts. Multiple stages over a long period of time are required before the patient is able to swallow perfectly; I have taken up to two years to complete these operations.

## Results of Radical Surgery

The results obtained in a series of 37 cases with carcinoma of the hypopharynx treated by radical surgical operations are shown in Table I. The survival periods are computed in months from the date of the first excisional operation for the carcinoma.

TABLE I

CARCINOMA OF HYPOPHARYNX. RESULTS OF RADICAL SURGERY. SURVIVAL IN MONTHS AFTER OPERATION

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number alive .. .. | 15 | 2 | 2 | 2 | 3 | 8 | 12 | 15 | 19 | 21 | 27 | 57 | 60 | 77 | 77 | 78 |
| Number died of cancer .. | 15 | 4 | 4 | 6 | 8 | 8 | 12 | 12 | 12 | 15 | 15 | 20 | 23 | 23 | 33 | 66 |
| Number died of other cause.. | 4 | 2 | 10 | 30 | 91 | | | | | | | | | | | |
| Number died of operation .. | 3 | 3 days | | | 23 days | | | 6 weeks | | | | | | | | |
| Total Number .. .. | 37 | | | | | | | | | | | | | | | |



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The results must be judged against this background. The majority of these patients treated by radical surgery had advanced carcinoma in the hypopharynx for the tumour had affected extensive areas and frequently infiltrated the cervical œsophagus, larynx, trachea and thyroid gland. In 16 patients (47 per cent.) there were metastases in the cervical lymph nodes which were proved by histological examination. The patients suffered severely from dyspnœa, stridor and dysphagia; two patients had a palliative gastrostomy and another a palliative tracheotomy. Some had been pronounced untreatable and were awaiting death with the help of sedatives. Others had received radiotherapy but the disease was uncontrolled. The only encouraging feature was the splendid spirit of the patients and their desire that something should be done to help them in their plight. It is pointed out that a radical operation provides immediate palliation in addition to giving the possibility of cure.

Three patients died at intervals of 3 days, 23 days and 6 weeks after the operation. The causes of death were respectively cerebral anoxia, bronchopneumonia and carotid artery hæmorrhage.

Four patients died of causes other than cancer; the longest survivor in this group lived 7 years 7 months without recurrence of the carcinoma and she died age 75 years from arteriosclerosis and hypertensive heart failure.

Fifteen patients died of cancer at intervals varying from 4 to 66 months after the excisional operation. The longest survivor in this group died from a carcinoma of the tongue.

Fifteen patients are alive at intervals varying from 2 to 78 months after the excisional operation. The numbers of survivors at different intervals following the excisional operation are shown in Table II.

TABLE II

CARCINOMA OF THE HYPOPHARYNX. NUMBER OF SURVIVORS AT DIFFERENT INTERVALS FOLLOWING THE EXCISIONAL OPERATION

| Interval in Months | Number of Survivors |
|---|---|
| 12 | 22 |
| 24 | 10 |
| 36 | 7 |
| 48 | 7 |
| 60 | 6 |

In 14 patients in this series the carcinoma commenced in the post-cricoid region or invaded it from some other primary site in the hypopharynx. Seven patients were alive 1 year after the operation; three patients were alive more than 5 years later, namely for 77, 77 and 91 months respectively.

These surgical operations do not cause mutilation; the patients have a



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normal neck except for healed incisions and a tracheostomy. They can dress normally and swallow everything, and I have not had a case of fibrous stricture formation at the junction of the skin pharynx and cervical œsophagus or elsewhere. The patients are able to work and to live almost normal lives.

*Note:* Since this paper was given in June, 1957 three of the patients in Table I have died of cancer 8, 9 and 13 months after the operation, leaving 12 survivors. The longest survivor in this group is alive in April, 1958, 88 months after the operation.

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