four years. She complained of heartburn after operation, but this was successfully treated by alkalis. She swallows without difficulty and has continued her work as a housewife.

Two patients continue to thrive two years after operation; one of them, a woman, is now 69. Two other patients have survived for over 18 months—both had a carcinoma situated in the middle third of the oesophagus.

Of the 72 cases of carcinoma of the oesophagus at various sites 29 had resections, and in 14 the patient survived longer than a month, giving a mortality rate of 51%. Supra-aortic anastomoses had been performed on 7 of the 15 patients who died within the month. The resectability rate was 40%. Eight palliative operations were performed, and three of these patients lived longer than six months.

Jejunostomy was performed on 15 patients and gastrostomy on 13; 7 of these 28 patients have lived longer than six months. No patient in the total series who was not treated by radical operation has lived longer than two years.

Summary

An analysis of the various clinical features observed in 159 patients suffering from carcinoma of the oesophagus has been made. Cases of carcinoma arising in the stomach and involving the oesophagus have been excluded.

Of the investigations, oesophagoscopy is the more exact method of obtaining correct information about the presence or absence of a growth in the gullet. Repetition of a barium swallow may at times be necessary to avoid missing the presence of a small growth.

The use of concentrated liquid food facilitates the preparation of the patient to withstand the severe radical or less severe palliative procedures. With radical treatment, although the mortality is high (50% approximately), the patient may be returned to a normal state with the ability to swallow restored.

BIBLIOGRAPHY

- Allison, P. R. (1942). *Brit. J. Surg.*, **30**, 132.
 Franklin, R. H. (1942). *Ibid.*, **30**, 141.
 Garlock, J. H. (1938). *Surg. Gynec. Obstet.*, **66**, 534.
 — (1944). *J. thorac. Surg.*, **13**, 415.
 — (1947). *Ibid.*, **16**, 215.
 Sweet, R. H. (1945). *New. Engl. J. Med.*, **233**, 1.
 — (1946). *Ann. Surg.*, **124**, 653.
 — (1947). *J. Amer. med. Ass.*, **135**, 485.
 Turner, G. G. (1933). *Lancet*, **2**, 1315.
 — (1936). *Ibid.*, **1**, 67.

The Hungarian News and Information Service in London, the official mouthpiece of the Hungarian Government, has lately issued several announcements on medicine and science in that country. On March 15, 83 Kossuth Awards were presented at a ceremony in the House of Parliament at Budapest. Kossuth was the leader of the 1848 Hungarian revolution, and these national awards were instituted on the centenary of its outbreak, and are since given annually for outstanding work in the arts, sciences, industry, and agriculture. In the medical section this year Professor György Ivanovits received 10,000 forints for the isolation of vitamin B₁₂, Professor Ferenc Kiss a similar sum for research on the vegetative nervous system and the lymphatics, and Professor Imre Tőro 20,000 forints for the discovery of a new mechanism of cell division. According to a report by the secretary-general of the Academy of Sciences there will be 25 scientific congresses in Hungary during the year, to which 200 foreign guests will be invited. In May there will be a medical congress on the work of Sándor Korányi (1866–1944), a specialist on traumatic diseases. A new Hungarian Biological Association was founded on March 30 at a meeting at the Academy of Sciences. Professor Sándor Jávorka, who received a 1952 Kossuth prize for his studies on the Hungarian flora, was chosen as president, and István Boros, director of the National Science Museum, as secretary.

CANCER OF THE HYPOPHARYNX AND ITS SURGICAL TREATMENT

BY

RONALD W. RAVEN, O.B.E., F.R.C.S.

Surgeon, Westminster (Gordon) Hospital; Surgeon, the Royal Cancer Hospital

Cancer in any part of the pharynx is a serious disease, for it causes severe suffering and is attended by a high mortality. In the hypopharynx these effects are maximal because of gross interference with respiration and deglutition, and the number of patients who have been cured is small. Thus any form of treatment that will relieve the patient's suffering, and is also designed to effect a cure, is welcomed. Contemplation of the serious plight of patients with this disease stimulated me several years ago to study the surgical problems involved in the radical extirpation of the hypopharynx and its lymphatic drainage, and I studied the work of Trotter (1929, 1932), Colledge (1940–3), and Wookey (1948) with profit. In addition, by the clinical examination of patients and a study of pathological specimens and necropsy reports, I sought a better understanding of the behaviour of the disease.

The object of this paper is to present some of my experiences in the treatment by radical surgical operation of a series of 18 patients with cancer of the hypopharynx. Most of them were suffering from advanced disease; some had been pronounced untreatable, were in a sad plight with dyspnoea, stridor, or dysphagia, and had been sent home to await their end. Others had received radiotherapy, but the disease was extending. One patient had had a tracheotomy, with severe dermatitis of the skin of the neck and anterior chest wall; another patient had had a gastrostomy. Their ages varied from 38 to 75, and many were in a very poor general condition.

Classification and Spread of the Disease

Trotter delineated the following areas as the origin of the disease: the epiglottis, glosso-epiglottic fold, aryepiglottic fold, pyriform fossa, posterior wall, and the post-cricoid region. In many patients I was unable to determine the site of origin owing to the large area of the hypopharynx which was involved, even from the pharyngo-oesophageal junction to the oropharynx. In some patients the disease is of multicentric origin, and malignant foci are present in several parts of the hypopharynx and larynx. The growth possesses a high degree of malignancy and is usually a squamous-cell ulcerating lesion. From its origin the disease spreads as shown in Table I.

TABLE I.—Cancer of the Hypopharynx: Methods of Spread

Direct extension	Pharynx, oesophagus, pharyngo-laryngeal septum, larynx, trachea, thyroid gland, internal jugular vein, pre-vertebral fascia, cervical vertebrae, skin.
Lymphatic metastases	Deep cervical, para-oesophageal, and superior mediastinal lymph nodes.
Haematogenous metastases ..	Lungs, liver.

When the growth is localized to one-half of the hypopharynx the deep cervical lymph nodes on the same side are often involved, but those on the opposite side may also be affected. If the growth passes across the midline the lymph nodes on both sides may be the site of metastases. Consequently in every patient I advise a block dissection of the

lymph nodes on both sides of the neck, but I leave the internal jugular vein and the sterno-mastoid muscle on the side where the lymph nodes are smaller.

Early Symptoms and Signs

These are often vague and the patient is unable to describe them accurately. There may be the sensation of a foreign body in the pharynx and a constant desire to clear the throat. Thickness of the voice develops and discomfort with swallowing occurs. As the disease progresses definite symptoms are experienced; these include dysphagia, dyspnoea, voice hoarseness, and a periodic cough. Patients sometimes come with a lump in the neck caused by lymphatic metastases, or severe pain in the ear, which is worse when swallowing occurs. The symptoms also vary according to the site affected. Thus, post-cricoid carcinoma affects women of a younger age group than men with the disease in other parts of the pharynx. In these patients dysphagia of various degrees is present for a number of years and becomes worse when malignancy develops. Minimal symptoms are usually caused by a growth in the posterior wall, and lymph-node metastases are often present when the patient is first seen. When the lateral wall and arytenoid regions are involved marked oedema develops which causes dyspnoea and voice hoarseness. In the clinical examination special attention is given to the neck for enlarged lymph nodes, and deviation, thickening, widening, and fixation of the pharynx and larynx. When dyspnoea and stridor are absent the hypopharynx and larynx are examined by the indirect and direct inspection methods, biopsy is performed, and the general condition of these organs is noted.

Radiological examination may give additional information regarding the site and extent of the lesion. Thus a soft-tissue shadow is seen in a plain x-ray film of the neck; tomograms and a barium swallow are also done.

The Problem of Stridor, Dyspnoea, Asphyxia, and Dysphagia

Several of my patients had severe respiratory obstruction caused by an extensive growth and surrounding oedema. Before the radical operation a tracheotomy must be avoided if possible, as this causes a number of technical difficulties. Nothing, therefore, is done in the pre-operative period to exacerbate the pharyngo-laryngeal oedema, and I defer direct pharyngoscopy and laryngoscopy in these cases until the patient is in the operation theatre for the major operation, when biopsy and histological examination are performed with the frozen-section technique. On several occasions, because of severe dyspnoea, even the extraction of carious teeth has been deferred until some time after the major operation. Sometimes, as the first step in the major operation, I have instituted a tracheotomy for almost complete respiratory obstruction under local infiltration analgesia with procaine hydrochloride (strength 1%). The remaining steps of the operation are then completed under endotracheal anaesthesia.

When the carcinoma involves the pharyngo-oesophageal junction complete dysphagia may be experienced. If this has been present for several days before the patient is seen, a gastrostomy may be required so that the general condition can be improved before the radical operation is performed. When, despite severe dysphagia, the patient's condition remains satisfactory, intravenous feeding is carried out and a gastrostomy is avoided. If a temporary gastrostomy is required it is allowed to close when the patient is able to swallow normally.

Principles of Radical Pharyngeal Surgery

A radical operation for cancer includes the removal of the affected organ with any malignant extensions to the neighbouring tissues and the regional lymph nodes as a monoblock dissection. In addition to the clinical and special examinations carried out, an exploration of the neck is required to determine the operability of the lesion and the extent of the resection which is required to eradicate the disease.

Laryngo-pharyngectomy and Laryngo-oesophago-pharyngectomy

These operations, combined with a bilateral lymph-node block dissection, fulfil the above conditions satisfactorily. The former operation is done when the growth is in the upper part of the hypopharynx involving the epiglottis and glosso-epiglottic and aryepiglottic folds. The latter operation is performed when it is in the lower part, such as the pyriform fossa or post-cricoid region. For the higher growths it is necessary to divide the pharynx above the level of the hyoid bone, which is included in the resection. When the growth is localized and low the cervical oesophagus is divided at the thoracic inlet and the hypopharynx below the hyoid bone. The lateral lines of excision lie posteriorly to both carotid sheaths, so that the cervical lymph nodes and cellular tissues are included in the block of tissue removed. The internal jugular vein and sterno-mastoid muscle are excised on the side where the lymph nodes are more extensively involved.

The Two-stage Operation.

—The excisional stage of the operation having been completed, the patient is left with a temporary lateral pharyngeal fistula through which a rubber feeding-tube is passed into the upper opening of the oesophagus and on into the stomach. After an interval of four to six weeks a reconstruction procedure is performed to re-establish normal deglutition. This is achieved by making a new hypopharynx from the skin of the neck and anastomosing it to the oropharynx above and to the oesophagus below. This new pharynx is placed in the normal anatomical position of the organ and is covered by a rotation skin flap from the neck or by a tubed-pedicle skin graft from the acromio-pectoral region. I have performed this operation in the majority of my patients.

The One-stage Operation with Primary Closure.—When conditions are favourable an end-to-end anastomosis can be made between the upper segment of the divided hypopharynx and the pharyngo-oesophageal junction, with primary closure of the neck. I performed this operation for a patient with a localized carcinoma in the right pyriform fossa and metastases in the right upper deep cervical lymph nodes. The procedure was

FIG. 1.—Clinical photograph of a woman aged 67 with a gastrostomy for complete dysphagia due to an extensive post-cricoid carcinoma invading the cervical oesophagus.

FIG. 2.—Clinical photograph of the same patient as in Fig. 1 after laryngo-oesophago-pharyngectomy (two-stage operation); she is alive and well 34 months later and swallows normally.

FIG. 3.—Clinical photograph of a woman aged 61 after laryngo-oesophago-pharyngectomy (two-stage operation) for a post-cricoid carcinoma; she is alive and well 12 months later and swallows normally.

facilitated by a severe fixed kyphosis of the cervical vertebrae, so that the divided ends could be brought into apposition without tension, and the connective tissues in the submaxillary region were reflected down to cover the anastomosis. The wound healed well and the patient was swallowing perfectly five weeks after the operation. He remains well 15 months later.

Pharyngectomy with Conservation of the Larynx.—It is a temptation to conserve the larynx when the carcinoma in the hypopharynx is relatively small. Thus for an early carcinoma in the pyriform fossa I have performed a partial pharyngectomy with reconstruction of the pharynx as a one-stage operation. In another patient with a post-cricoid carcinoma the entire hypopharynx was removed with the construction of a new skin pharynx.

Laryngo-partial Pharyngectomy.—In this operation a strip of the posterior pharyngeal wall is conserved, the patient being left with a median pharyngeal stoma. This is a great advantage in patients who have had a full course of irradiation and in whom degenerative changes have occurred in the skin and other tissues of the neck, rendering the construction of a new skin pharynx very difficult. The resources of the surgeon may be severely taxed in finding ways to solve these problems. I have found the formation of this stoma, with subsequent closure by hinged flaps and acromio-pectoral tubed pedicle flaps, a great help.

Choice of Operation

From my experience I feel that the best operations for cancer of the hypopharynx are laryngo-pharyngectomy and laryngo-oesophago-pharyngectomy, with removal of the cervical lymph nodes on both sides as a monoblock procedure. These should be carried out even when the primary growth is relatively localized, as they give the patient the best chance of a cure. Operations with conservation of the larynx are not nearly so satisfactory as regards function and the possibility of recurrence. For example, one patient who had a partial pharyngectomy for a carcinoma in the pyriform fossa developed metastases in the upper deep cervical lymph nodes on the opposite side two years later; another patient who had a resection of the hypopharynx and conservation of the larynx died from local recurrence one year later.

End-results of Operation

The present series comprised 18 patients with a squamous-cell carcinoma of the hypopharynx, proved by microscopical examination. In 14 the disease was very extensive in the pharynx; in some it extended into the oesophagus, larynx, or surrounding tissues in the neck. In nine metastases were proved microscopically in the cervical lymph nodes. Irradiation treatment had been given to four patients before surgery was undertaken for progressive disease. There was no operative mortality. The end-results with all types of operation are set out in Table II; it is realized that the patients must be followed up for a much longer period of time to get the final assessment.

TABLE II.—End-results with All Types of Operation

	Period in Months after Operation										
10 patients alive ..	2	11	12	12	14	15	15	24	25	34	
6 patients died of cancer ..	4	8	12	12	23	23					
2 patients died of other cause	2	10									

Laryngo-pharyngectomy and Laryngo-oesophago-pharyngectomy.—Twelve patients have undergone laryngo-oesophago-pharyngectomy and four laryngo-pharyngectomy (in three a portion of the pharyngeal wall was conserved, and in one an end-to-end anastomosis was done); the end-results are shown in Table II, which includes two patients who survived 12 and 23 months respectively after undergoing pharyngectomy with conservation of the larynx.

When the results of surgery are considered the condition of the patients after operation must be taken into account in addition to the survival periods. Operation brings relief from the distress of cyspnoea, stridor, and dysphagia; a gastrostomy is allowed to close, and a palliative tracheotomy with surrounding infection and dermatitis is converted into a well-managed tracheostomy. The patients are enabled to swallow normally all types of food, can wear ordinary clothes, and live happy useful lives. Voice production is variable, but not so good as after laryngectomy. A number of the men can return to work. A good example is that of a man with severe stridor who was considered elsewhere to be in a hopeless condition and who is now back at work. One female patient married for the second time after the operation, and another woman, aged 67, who had had a gastrostomy performed elsewhere for severe dysphagia, is well and swallowing normally 34 months later, and the gastrostomy has closed. None of my patients have developed a fibrous stricture at the junction of the new skin pharynx and oesophagus, or elsewhere.

Pharyngectomy with Conservation of the Larynx.—Two patients underwent this operation. One patient with a carcinoma of the left pyriform fossa had a partial pharyngectomy with a block dissection of the lymph nodes in the left side of the neck. She spoke and swallowed normally until metastases developed in the right upper deep cervical lymph nodes and she died 23 months later. The other patient had a post-cricoid carcinoma, and she requested that her larynx should be preserved. Total excision of the hypopharynx was performed with the construction of a new skin pharynx as a two-stage operation. The functional result was bad, as fluid entered the larynx on swallowing, so a gastrostomy was necessary. The patient died one year later from a recurrence in the neck.

Summary

An account is presented of some of my experiences in the radical surgical treatment of a series of 18 patients with carcinoma of the hypopharynx. Most of the patients had advanced disease and were suffering severely.

It is shown that radical surgery has an important place in the treatment, for distressing symptoms are relieved and there is the possibility of cure.

I believe the best operations are laryngo-pharyngectomy and laryngo-oesophago-pharyngectomy with a bilateral block dissection of lymph nodes as either one-stage or two-stage procedures.

Radical surgery can be undertaken also when irradiation has failed to control the disease. Patients live happy useful lives after the operation.

The length of survival is presented, and it is hoped time will prove that a number of them have received permanent benefit.

I have had the valuable co-operation of Dr. L. H. Morris and Dr. A. Chester in the anaesthesia of the patients; my registrars, house-surgeons, and the nursing staff have helped in every possible way, and I wish to thank them all. Portland Plastics Ltd. kindly supplied me with "polythene" tubing for use in my work.

REFERENCES

- Colledge, L. (1940-3). *Trans. med. Soc. Lond.*, 63, 330.
- Trotter, W. (1929). *Brit. J. Surg.*, 16, 485.
- (1932). *British Medical Journal*, 1, 510.
- Wookey, H. (1948). *Brit. J. Surg.*, 35, 249.

The U.S. Army Medical Service has decided to accept medical students as interns in Army hospitals immediately they qualify. This new scheme will start on July 1, when 146 senior medical students representing 51 medical schools will, provided they pass their examinations, be commissioned as first lieutenants in the Medical Corps Reserve and go to one of 10 Army teaching hospitals in the U.S. or to Tripler Army Hospital, Hawaii.