acute inflammation of the crico-arytænoid joint (*vide supra*), the relationship between cause and effect is obvious.

Difficulty in diagnosis will arise in the earlier phases of abductor paralysis when the physical signs of the primary lesion are not easy to detect—*e.g.* a small aneurysm in the concavity of the aortic arch, the early stages of a mediastinal growth, a pleuritic adhesion involving the recurrent nerve in the neighbourhood of right pulmonary apex, the incipient phase of certain cases of tabes, etc.

In the mechanical type of case—*i.e.* where the cord is motionless because of the fixation of its corresponding crico-arytænoid joint—we may not see the case till all signs of inflammation in the joint have passed off, and there may be nothing in the history of the onset or course of the trouble to indicate a mechanical cause of the immobility of the cord.

It is in such cases as these that a searching examination, coupled with well-balanced judgment should enable us to arrive at a fairly accurate conclusion.

One fact has struck me in reviewing the cases on which this paper is based, and I am bound to confess that I do not grasp its significance. In every instance it has been the left vocal cord which has been immobilised, including those cases which recovered. Can it be that they are not all due to involvement of the crico-arytænoid joint, and is it possible that a peripheral neuritis of unknown origin will explain better the temporary immobility of the cord?

CONCLUSION.

The object of this short communication will have been achieved if I have been able to extend the horizon of the reader with regard to the prognosis in certain cases of paralysis of the left vocal cord. When we find that it remains motionless in the middle line on phonation and an exhaustive examination fails to reveal any gross lesion in the origin or course of the recurrent laryngeal nerve, we should have sufficient confidence in our opinion to say that recovery is not out of the question, to feel that we are not justified in assuming the "black cap," and thus unnecessarily condemning the patient to a life of inaction and all the evils which this may bring in its train.

INTRINSIC CANCER OF THE LARYNX AND THE OPERATION OF LARYNGO-FISSURE,

WITH A DESCRIPTION OF SOME NEW INSTRUMENTS SPECIALLY DESIGNED FOR IMPROVING THE TECHNIQUE.

BY IRWIN MOORE, M.B., C.M. EDIN.,

(Continued from p. 143.)

Surgeon to the Throat Hospital, Golden Square, London, W.

Thyro-fissure for papilloma is not nowadays employed on account of repeated recurrence; direct laryngoscopy and endoscopic removal has taken its place.

Semon¹ reports a case in which 17 thyro-fissures were performed for papilloma on the same patient with failure to cure.

¹ "Proc. Laryngol. Soc. Lond.," 1894, p. 62.

Morell Mackenzie,¹ in 1871, also summarised all the cases of thyrotomy—28 in number—performed up to 1869, of which only 6 were malignant, and he compared the merits of this operation in relation to life and recurrence of growth with 100 consecutive cases he had treated endo-laryngeally—of which 93 were benign. He states that in the 28 cases of thyrotomy—of which 6 were malignant—9 patients died, and there was recurrence in 6 cases, whilst not one of the 93 benign cases treated through the natural passages terminated fatally, and recurrence took place in only 6 cases. Out of the total 100 cases, there were only 4 malignant cases and only 2 cases terminated fatally. Thyrotomy was performed in 3 of these cases, 1 being malignant, and death followed eight months after operation, this being the only case amongst the 3 thyrotomies.

Later, in 1873,² he republished these statistics along with other cases recorded up to date, 48 in all, of which 7 were malignant. He states that of these, absence of recurrence occurred in only 14.58 per cent. of cases, whilst recurrence occurred in 22.91 per cent., and death from operation in 8.33 per cent.

Morell Mackenzie described the operation as a very serious one as regards danger to life and destruction of function of the voice.

Timothy Holmes³ also expressed the opinion that it was a very serious surgical procedure and it ought to be reserved for cases of proved necessity.

Billroth⁴ (Vienna), between 1870 and 1884, performed laryngo-fissure on 8 cases of laryngeal cancer—in 1 there was no recurrence after two years and nine months, in another case the after-history was wanting, and the other 6 died of recurrence (Salzer, Vienna).

Billroth,⁵ in eighteen years between 1870 and 1888, performed 10 laryngo-fissures for laryngeal cancer. Death followed operation in 3 cases (3 per cent.), recurrence in 4 (40 per cent.), whilst there were only 3 cures (30 per cent.) (Chiari).

Paul Bruns⁶ (Berlin), in 1878, published an account of 19 cases of malignant disease treated up to this time by thyrotomy, which showed that the results were most unsatisfactory. Two patients died shortly after the operation, local recurrence occurred in 14 immediately or a few months after operation—in 1 case there was recurrence in one year—and in 1 case death occurred twenty-two months after operation from cancer of the kidney, whilst there was no trace in the larynx itself. The results were not reported in 3 cases. Summary—only 2 survived a year.

Bruns drew the following conclusion: "That the attempt at radical extirpation of cancer by means of thyrotomy has proved itself completely unsatisfactory and worthless."

These bad results were due partly to the operation being performed in advanced and unsuitable cases, and partly to faulty technique. Again, this operation was performed in many cases by the general surgeon and

¹ "Growths in the Larynx," 1871, p. 92.

² "Dis. of Throat and Nose," 1880, i, p. 327. "The Results of Thyrotomy for the Removal of Growths from the Larynx," *Brit. Med. Journ.*, 1873, i, pp. 458 and 486.

³ *Brit. Med. Journ.*, 1873, i, p. 531.

⁴ Salzer, Langenbeck's *Arch. f. Klin. Chirurgie*, 1885, xxxi, p. 848. Quoted by StClair Thomson, "Dis. of Nose and Throat," 1916, p. 492.

⁵ Chiari, "Trans. Amer. Laryngol. Soc.," 1909, p. 20.

⁶ "On the Relative Merits of Endo-laryngeal Treatment and Thyrotomy," Berlin, 1878, p. 73.

not by the experienced and skilled laryngologist. In these early days the majority of cases died from causes directly attributable to the operation and its sequences, such as septic pneumonia or bronchitis. In consequence of Bruns and others denouncing thyro-fissure, the following ten years, *i. e.* from 1878 to 1888, the operation was almost abandoned in favour of laryngectomy, and only 11 cases of laryngeal cancer were treated by thyro-fissure (Semon).¹

The position of malignant disease of the larynx during this decade may be gathered from the opinion expressed by J. Nolan Mackenzie² (Baltimore), in 1916, when looking back on the work at the Golden Square Throat Hospital in the seventies and early eighties of last century. He says: "There was but one disturbing and discordant memory in the treatment of cancer of the larynx, viz. the piecemeal removal of the growth through the natural passages which to-day would be considered as a means of slow death. The growth was stimulated at once into much quicker activity, the patient naturally became much worse, and was sent to his long home much earlier than if he had been left severely alone. There was never a thought of a cure."

The first great exponent of this operation was Arthur Durham, and if his advice and experience had been followed in place of the condemnatory opinions of Bruns, Billroth, and Morell Mackenzie, etc., this operation would not have fallen into such complete abeyance and discredit until revived by Butlin and Semon in 1890; for Durham,³ as long ago as 1872, in referring to this operation, remarked: "A just estimate of the general and special merits of the operation of opening the larynx by section of the cartilages in order to facilitate the removal of morbid growths can only be obtained by personal experience, or by the careful study of the recorded experience of others, and he had come to the following conclusions, viz. that the danger and difficulties attending it are neither so numerous nor so considerable as have been represented and commonly supposed, and that the success hitherto achieved has been so marked and so indisputable as to justify and encourage in any such cases as may seem appropriate, an earlier, bolder, and more ready resort to this method than has hitherto prevailed."

Butlin, in 1883,⁴ collected together from various sources 50 cases of carcinoma and 23 of sarcoma of the larynx; of the latter, 17 were intrinsic, 3 were extrinsic, and 3 of uncertain origin. He referred to the cases collected by Morell Mackenzie and treated by endo-laryngeal methods, and considered that too favourable a view had been taken of these cases. At this time Butlin's opinion inclined towards hemilaryngectomy and laryngectomy, as shown by the following views: He says "not the slightest encouragement is afforded by published accounts to induce one to perform the operation of thyro-fissure, or the sub-thyroid incision, for the removal of carcinoma whether extrinsic or intrinsic." He also remarks that malignant disease of the larynx does not appear to infiltrate so deeply or spread so rapidly, and it usually runs its course without affecting the lymphatic glands. It is, therefore, amenable to treatment by complete removal of the part from which it grows which may necessitate partial or complete eradication."

Semon, in 1886, drew attention to some important points in the practical diagnosis of *early* malignant diseases of the larynx, which

¹ Cited by Shurley, "Dis. of Throat and Nose," p. 593.

² *Ann. Otol., Rhinol. and Laryngol.*, March, 1906.

³ "Trans. Med. Chir. Soc.," 1872, lx, p. 38.

⁴ "Malignant Dis. of the Larynx," 1883, pp. 57-63.

resulted in Butlin recommending that thyro-fissure should be reinstated in its place.

Butlin¹ first began to perform thyro-fissure for cancer of the larynx in 1886, and from 1890 he confined himself entirely to intrinsic cases. Up to 1890 he had performed ten operations on nine patients conjointly with Semon, of whom one-third died of the operation, one-third of recurrence, and the remaining third sufficient time had not elapsed since operation to claim success.

Butlin, up to 1894 operated on 14 cases, of which 2 (14·3 per cent.) died from the operation, 6 relapses (43 per cent.) occurred, whilst there were 6 cures (43 per cent.), made up of 3 relative and 3 definite cures² (Chiari).³ Between 1890 and 1907⁴ he had performed 23 thyro-fissures on 21 patients, with only 1 death, 10 of which cases were quite successful.

Delavan⁵ (New York), in referring to the general statistics up to 1904, says that permanent cures were as high as 44 per cent., while the death-rate could be placed at about 11 per cent. He finds, however, that nearly 70 per cent. of Butlin's cases lived for more than 3 years after operation, whilst his deaths from operation were 9·5 per cent.

Butlin lost no case from operation after 1899.

Semon⁶ first carried out this operation independently of Butlin in 1891. Between 1886 and 1896 he had operated on 8 cases, of which 2 (25 per cent.), died from the operation; there were 2 (25 per cent.) recurrences and 5 cures (62·5 per cent.), made up of 50 per cent. relative and 12·5 per cent. definite cures.⁷ Between 1891 and 1904 he had operated on 20 cases, of which 1 died from operation (5 per cent.), and 2 recurrences occurred (10 per cent.), whilst his cures showed an increase to 17, *i. e.* 85 per cent. were well (Chiari).⁸

In 1907 Semon⁹ had operated on 33 cases (25 cases being of undoubted malignancy), and his results showed a "lasting cure" in 80 per cent. There were 13·6 per cent. recurrences with 8·8 per cent. fatal results. Semon's last fatal case from operation was in 1894.

The period since 1890, owing to the diagnostic skill of Semon and the operative skill and technique of Butlin, was one in which great advances were made, resulting in this operation being reinstated in its proper place.

Sendziack¹⁰ (Warsaw), reviewed, in 1897, the general statistics of laryngo-fissure, and showed that out of 85 cases (92 laryngo-fissures) operated on between 1851 and 1894-9 (9·8 per cent.) deaths followed the operation; there were 49 (53·3 per cent.) recurrences, insufficient observation in 8 cases (8·7 per cent.), and cure in 21·7 per cent., made up of 13 per cent. relative and of 8·7 absolute cures. Delavan,¹¹ in revising these statistics, gives the period as between 1876 and 1894. Again, in 1899, Sendziack reviewed 136 cases from 1851 to 1907, which showed 25 per cent. of cures. Later, in 1908, he refers to 214 cases, from 1888

¹ "Trans. Med. Soc. Lond.," 1907, xxx, p. 140.

² *Relative cure, i. e.* no recurrence for one year. *Definite cure, i. e.* no recurrence after three years.

³ Chiari, "Trans. Amer. Laryngol., Rhinol., and Otol. Soc.," 1909, p. 20.

⁴ "Trans. Med. Soc. Lond.," 1907, xxx, p. 141.

⁵ "Trans. Amer. Laryngol. Assoc.," 1904, p. 155.

⁶ "Trans. Med. Soc. Lond.," 1907, xxx, p. 140. *Laryngoscope*, 1903, xiii, p. 887.

⁷ *Archiv für Laryngol.*, 1897, vi, p. 375.

⁸ "Trans. Amer. Laryngol., Rhinol., and Otol. Soc.," 1909, p. 20.

⁹ "Trans. Med. Soc. Lond.," 1907, xxx, p. 127.

¹⁰ Chiari, *op. cit.*, 1909, p. 21.

¹¹ *Journ. of Laryngol., Rhinol., and Otol.*, 1900, xv, p. 651.

to 1907, which showed 50 per cent. of cures, the death-rate from operations falling from 9·8 per cent. to 2·4 per cent.

Schmiegelow¹ (Copenhagen), in 1897, gave the statistics of 49 cases from 1890 to 1896, in which there were 7 deaths (14·3 per cent.) from operation, and recovery took place in 56 per cent. of cases made up of relative recovery, 21 cases (42·6 per cent.) and definite recovery in 7 cases (14·3 per cent.) cases.

Recurrence occurred in 14 (28·5 per cent.) cases.

Clinton Wagner² (New York), in 1900, reported 15 thyro-fissures, 4 of which were malignant; 5 of these patients were then living at periods of 1 year, 12 years, and 17 years respectively; of those not then living, one survived 2 years, one 3 months, and one 10 weeks, and in none of these cases was death due to the operation of thyro-fissure. The name of Clinton Wagner has been linked with that of Butlin in considerably developing and simplifying the method of performing this operation.

D. Bryson Delavan³ (New York), in 1900, collected the statistics of laryngo-fissure in the case of 7 operators, viz.: Von Bergmann (Berlin), Kocher (Berne), Mikulicz (Breslau), Butlin, Chiari (Vienna), Schmiegelow (Copenhagen), and Semon, and found that out of 50 cases there were 9 deaths from operations (18 per cent.), 39 (78 per cent.) (result of 2 cases not reported) recovered from the operation, whilst 6 (12 per cent.) died from pneumonia, 9 (18 per cent.) from recurrence, and 1 (2 per cent.) from sepsis; 16 (32 per cent.) were well over 2 years.

Chiari⁴, in referring to these statistics, gives 35 recoveries (70 per cent.) made up of 23 (46 per cent.) relative recoveries, *i. e.* no recurrence for 1 year, and 12 (24 per cent.) definite recovery, *i. e.* no recurrence after 3 years.

Frank Hartley⁵ (New York), in 1902, reviewed the literature of thyro-fissure from 1832 to 1902.

Chiari⁶ (Vienna), in 1909, reviewed the general statistics of laryngo-fissure, and refers to 99 cases between 1895 and 1908. Of these 5 (5 per cent.) died from the operation, 19 (19 per cent.) from recurrence, insufficient operation in 23 (23·3 per cent.); whilst the cures amounted to 52·4 per cent., made up of 33·3 per cent. relative and 19·1 per cent. absolute cures. He also gives his own personal statistics of 4 cases of laryngo-fissure for intrinsic cancer of the larynx from 1894 to 1907. Death followed operation in 3 cases (7·32 per cent.), recurrence in 11 (27 per cent.); whilst he divided the "cures," amounting to 36·75 per cent., into relative 9·75 per cent., and definite 27 per cent. In 12 cases (29·2 per cent.), there had been too short an observation period.

Chevalier Jackson⁷ (Pittsburgh), in reporting his results up to 1913, says that out of 27 cases, 24 were free from recurrence at the end of the first year, 3 died of recurrence, and that he had no operative mortality.

StClair Thomson, between 1900 and 1917, has also achieved successes,

¹ *Ann. des Mal. de l'Or*, April, 1897. Cited by Chiari, "Trans. Amer. Laryngol., Rhinol., and Otol. Soc.," 1909, p. 21. Cited by Delavan, *JOURN. OF LARYNGOL., RHINOL., AND OTOL.*, 1900, xv, p. 651.

² Quoted by Shurley, "Dis. of Throat and Nose," p. 592.

³ Delavan, "A Consideration of the Statistics of the Operation for the Relief of Malignant Disease of the Larynx," *New York Med. Journ.*, 1900, lxxii, p. 449. Abstract, *JOURN. LARYNGOL., RHINOL., AND OTOL.*, 1900, xv, p. 649.

⁴ Chiari, "The Treatment of Cancer of the Larynx," "Trans. Amer. Laryngol. Assoc.," 1909, p. 19.

⁵ *New York Med. Journ.*, 1902, lxxxvi, p. 1020.

⁶ "Trans. Amer. Laryngol., Rhinol., and Otol. Soc.," 1909, pp. 18 and 21.

⁷ "Peroral Endoscopy and Laryngeal Surgery," 1915, p. 657.

which yield a permanent cure in 80 per cent. of cases. In his first series¹ of 10 cases, between 1900 and 1910, he reports that only one patient died from local recurrence, and the death-rate from operation was *nil*! In the only two patients in which there was local recurrence the disease reappeared within the year following the operation.

He had performed² thyro-fissure, up to date, on 35 patients for intrinsic cancer of the larynx. In 3 the patients were females and in 32 males. The ages of the patients varied from forty-four to seventy-five years. There were no operative deaths.

Twenty-eight cases were "relative cures"—i. e., no recurrence for one year (80 per cent.). Fourteen of these were well 3 years after the operation; one of them is well 10 years after operation. Some of the others, being elderly subjects, have died of other complaints.

In 6 cases there was recurrence of the growth within a year.

In all cases a tracheotomy was performed first, but in many instances the tube was removed at the end of the operation.

SUMMARY OF THE RESULTS OF THYRO-FISSURE AND COMPLETE LARYNGO-FISSURE.

A comparison of these statistics of different operators show that the results have greatly improved during recent years. From 1851 to 1894 the percentage of cures was only 22 per cent. and recurrence in 20 per cent. of cases.

From 1888 to 1894 the percentage of cures increased to 50 per cent., whilst recurrence remained at 20 per cent.

Since 1894 the percentage of cures varied from 52 per cent. to 80 per cent., whilst recurrence varied from 19.1 per cent. to 13.6 per cent. (Chiari). Since 1904 the death-rate from operation in experienced hands has been reduced to *nil*.

It would appear that the percentage of cures still vary with different operators from 25 to 80 per cent., owing probably to imperfect technique, or to operating on unsuitable cases, whilst Chiari³ says that personal statistics show the results to be so exceedingly variable that the percentage of death varies from 0 to 25, recurrence from 0 to 92, and cure from 7.7 to 87.

These later statistics show the enormous progress in the hands of the skilled and experienced specialist over the results of 25 years ago. Nowhere in the whole of the realm of the surgery of malignant diseases, says Chevalier Jackson,⁴ have such results been obtained. This success is due partly to the earlier diagnosis of the disease and partly to improvement in operative procedure.

While diagnosis and technique have improved, there still remains room for a better instrumentarium. Just as in endoscopy the wise selection of instruments may be a great factor of success, so in this operation of thyro-fissure it is important that suitable instruments should be used if we are to attain the best results. The instruments⁵ which I

¹ "Trans. Med. Soc. Lond., 1912, p. 200. *Brit. Med. Journ.*, 1912, i, p. 355. *Lancet*, 1912, i, p. 504.

² Verbal communication to author of cases to be published *in extenso*.

³ "Trans. Amer. Laryngol., Rhinol. and Otol. Soc.," 1909, p. 22.

⁴ "Peroral Endoscopy and Laryngeal Surgery," 1915, p. 650.

⁵ Shown at the Laryngological Section, Royal Society of Medicine. See "Proc. Roy. Soc. Med.," 1915, ix (Laryngol. Section), pp. 34-36; also Irwin Moore, "The Operation of Laryngo-fissure: Some New Instruments specially designed for Improving the Technique," *Lancet*, 1916, ii, p. 675.

have designed for this operation have been for some years in use, though they have not yet been formally introduced to the profession, since it was my desire that they should first stand a fair trial. They are now used and recommended by StClair Thomson¹ and other of my colleagues.

References to medical literature and reports of cases show that the work of Butlin and Semon in this country has been ably followed up by StClair Thomson, Tilly, Lambert Lack, Douglas Harmer, Dundas Grant, William Hill, Dan Mackenzie, Logan Turner, Brown Kelly, William Milligan, Richard Lake, De Santi, Cathcart, Barwell, Jobson Horne, and others in this country. Whilst abroad by Solis-Cohen, Delavan, Chevalier Jackson, Clinton Wagner, Chiari, Koshier, Schemiegelow, Moure, and others.

The object of this article is to embody the practical experience accumulated as a result of co-operation with my colleagues in over forty laryngo-fissures in this country during the past twelve years, also to enumerate the various up-to-date developments and improvements which have been found of service in increasing the successful results of this operation, and in reducing the death-rate.

Indications for Laryngo-Fissure.²

1. Exploratory purposes.
 2. Removal of foreign bodies in the larynx, when found impossible *per vias naturales*, by an experienced specialist.
 3. Injuries to the larynx—to avoid the troublesome results of serious lesions.
 4. Laryngocele.
 5. Stenosis of the larynx from congenital webs and from chronic inflammatory lesions.
 6. Acute laryngeal perichondritis.
- erculosis (including lupus). } Indications for rare.
- ie larynx. }
- in the larynx.
- (extirpation of large benign tumours in which intra-geal treatment has failed).
- nt
- eration of laryngo-fissure for intrinsic cancer of the
- larynx some cases paper specially deals.

Certain details in the technique have an important bearing on the immediate and after-results of the operation, and it is well to consider them under the following headings:

1. Preparation of the patient for operation.
 - (a) Preliminary hypodermic injection of narcotics.
 - (b) Intradermic injection of cocaine or its substitutes in the middle line of the neck.
2. Choice of general anæsthetic.
3. Posture of the patient during operation.
4. Cutaneous incision and dissection of pre-laryngo-tracheal region.

¹ "Intrinsic Cancer of the Larynx after Operation by Laryngo-fissure," "Proc Roy. Soc. Med.," 1915, ix, (Laryngol. Section), p. 8.

² Semon, "Indications for Thyrotomy," 13th Internat. Med. Cong. (Paris), Aug., 1900. Abstract, JOURN. OF LARYNGOL., RHINOL., AND OTOL., 1900, xv, p. 504. Urribuela (Madrid), "Indications for and Technique of Thyrotomy," 13th Internat. Med. Cong. (Paris), Aug., 1900. Abstract, JOURN. OF LARYNGOL., RHINOL., AND OTOL., 1900, xv, p. 612.

5. Puncture injection of cocaine into the trachea preliminary to tracheotomy, also into the larynx preliminary to fissure.
6. Temporary tracheotomy.
7. Division of the thyroid cartilage.
8. Swabbing of interior of the larynx with cocaine.
9. Tamponage of trachea above tracheotomy tube.
10. Examination of interior of larynx.
- Inspection and palpation of the growth
11. Subperichondrial resection of the growth.
 - (a) Separation of the perichondrium from the inner surface of the thyroid cartilage.
 - (b) Parallel horizontal incisions, first below and then above the growth, with scissors.
 - (c) Separation of the mass from the arytaenoid region.
12. Stoppage of bleeding.
13. Closure of the larynx and neck wound.
14. *Removal of the tracheotomy tube.*
15. Post-operative posture, and after-care of the patient.
16. Result of operation as regards recurrence and voice.

PREPARATION OF PATIENTS FOR OPERATION.

The rules of strict aseptic surgery should be carefully observed both before and during the operation. Although complete asepsis cannot be obtained, yet endeavours should be made to procure it as perfect as possible. The mouth should be carefully examined and all decayed teeth or stumps removed, whilst special attention should be given to the toilet of the mouth for at least forty-eight hours before operation, antiseptic washes being freely used. It is advisable to cut off all tobacco and alcohol for at least a week beforehand.

Patient should be placed in a nursing home or hospital at least twenty-four to forty-eight hours before the time of operation and be prepared in the usual way for the anæsthetic. A purgative should be administered two nights before the operation, followed by a saline purge next morning, so as to avoid unnecessarily disturbing the patient on the morning of the operation. The importance of preliminary purgation in eliminating toxins from the alimentary canal and system prior to this operation has been repeatedly drawn attention to by writers.

PRELIMINARY HYPODERMIC INJECTION OF NARCOTICS.

Preliminary narcotics not only encourage quiet induction of anæsthesia, which means less straining and congestion, but also diminish surgical shock, especially in the case of patients who are frightened or of a highly nervous temperament. By their calmative influence patients may be entirely freed from the fear and nervous tension which generally precedes an operation.

Crile (Cleveland, Ohio) says: "We should obliterate the emotion of fear and worry by morphia, which directly prevents shock."

Hewitt¹ considered that "for excitable, apprehensive patients the use of appropriate preliminary narcotics was almost essential to success."

Hughes Phillips² considers that the "preliminary injection of narcotics is, in most cases, invaluable and should be given in all cases where there is no idiosyncrasy, and he thinks it is worth while to give the patient

¹ "Proc. Roy. Soc. Med.," 1915, viii (Anæsth. Sect.), p. 19.

² Personal communication to author.

a trial dose a few days before the operation to make quite sure on this point. Morphine sulphate, gr. $\frac{1}{4}$, and atropine sulphate, gr. $\frac{1}{160}$, should be given three-quarters of an hour before the patient is brought into the theatre, and this not only allays the natural feeling of apprehension, but helps to prevent secretion and lessens the amount of general anæsthetic necessary. There is less tendency to cough or retch during the operation, and the annoyance caused by bleeding from this source is minimised. A further advantage is that if there are signs of shock, ether can be administered without giving rise to laryngeal spasm. If the patient is either specially nervous or of the alcoholic type, the addition of hyoscine hydrobromide, gr. $\frac{1}{100}$, is advantageous, or omnopon-scopolamine, 1 c.c., may be substituted for the morphine and atropine."

Bellamy Gardner¹ does not find that patients who require this operation are especially nervous beforehand, but looking forward to the relief of their symptoms. In view of this, he says narcotics are not called for as a preliminary routine from the psychological point of view, and as they reduce the vitality of the respiratory centre which may be required at its maximum activity at certain moments before the tracheotomy has been completed and cause somnolence and absence of coughing reflex during recovery, they are best avoided altogether.

Narcotics are undoubtedly valuable in plethoric, alcoholic, or muscular subjects, and it is said that one advantage in their use is that less anæsthetic is necessary, and, consequently, a lighter and safer degree of narcosis may be maintained throughout the operation. Chloroform lowers blood-pressure and conduces to shock. Atropine, administered before chloroform anæsthesia, checks excessive inhibition of the heart and controls and diminishes mucous secretions. Morphia, therefore, in the form of morphia sulphate, gr. $\frac{1}{4}$, in combination with atropine sulphate, gr. $\frac{1}{160}$, is frequently given as a hypodermic injection half an hour before general anæsthesia.

Levy² has recently expressed the opinion that "atropine may foster cardiac syncope under chloroform."

Since morphia and cocaine are antidotes to each other, the injection of morphia acts as a prophylactic in preventing the risk of cocaine poisoning, consequently cocaine may be used during the operation for controlling the laryngeal reflexes with far greater freedom and in larger quantities.

Some patients, however, are most susceptible to narcotics, therefore if they are used in any form, great care and discretion should be exercised in each individual case, especially when prescribing heroin, for it has been found that patients have been profoundly narcotised by $\frac{1}{12}$ gr. It is a well-established rule that narcotics should not be given in patients suffering from any respiratory difficulties, therefore the importance of avoiding respiratory depressants cannot be disputed in cases of malignant disease of the larynx, in which the glottis is narrowed, owing to partial or complete fixation of the vocal cord.

REGIONAL METHOD OF INFILTRATION BY COCAINE OR ITS SUBSTITUTES.

The initial incision and dissection for both tracheotomy and laryngofissure may be rendered practically bloodless by the intradermic injection of the line of incision in the neck with cocaine or its substitutes twenty minutes before operation. As the result of careful preliminary prepara-

¹ Personal communication to author.

² "Proc. Roy. Soc. Med.," 1917, xi (Sect. Anæsth.), p. 12.

tion, many recent operations have been performed without even using artery forceps or tying a vessel.

The intradermic infiltration method of local anæsthesia with cocaine was first introduced by Reclus¹ in 1889, and he recommended that a weak solution of from 1 to 2 per cent. should be used, insensibility being obtained over an area of about half an inch from the punctures.

Cocaine solution, if used by itself, may be of 5 per cent. strength for hypodermic injection, and should be freshly prepared for each operation to avoid the formation of a fungus which may appear in a few hours,

FIG. 1.—Local infiltration anæsthesia of the middle line of the neck showing position where the hypodermic needle should be inserted through the skin.

when it becomes septic. Again, it becomes acid on standing, and loses greatly in anæsthetic value. One grain of cocaine is a safe dose for absorption in an adult (Chevalier Jackson).

Novocain is less toxic than cocaine, and may be used in a 2 per cent. solution with a few drops of adrenalin.

Eudrenine, a mixture of eucaine and adrenalin, is by far the best preparation. It is put up in ampoules of 0.5 c.c., containing $\frac{1}{12}$ gr. of beta-eucaine hydrochloride (1 per cent.), with $\frac{1}{40000}$ gr. of adrenalin chloride (1 in 30,000) in physiological sodium chloride solution preserved with

¹ P. Reclus et Isch. Wall, *Revue de Chirurgie*, 9th Année, 1889.

chloreton. It is to be preferred to cocaine because its toxicity is less and the contents of three or four of these ampoules may be injected without any risk. In all infiltration work it is important to remember that to anaesthetise the skin the injection should be intradermic—*i. e.* between the layers of the skin—not hypodermic—*i. e.* beneath it—since the sensory nerve endings are situated just beneath the epithelium. The position of the needle is correct if its point can be seen from the surface. Pain of the initial prick of the needle may be done away with or reduced by applying to the skin a drop of pure carbolic acid on the point of a probe (Fig. 1). One or two deep injections may be given into the tissues, but this is not necessary since the subdermal tissues are not sensitive.

The author generally uses a long needle 3 in. in length, which is inserted through the skin at the suprasternal notch, the site of puncture having first been anaesthetised by a drop of pure carbolic. The needle is pushed upwards intradermically—along the middle line of the neck as far as the upper border of the thyroid cartilage, whilst the skin is drawn or threaded downwards on to the needle as it advances by the thumb and forefinger of the left hand. This causes little or no pain. The needle is gradually withdrawn whilst the solution is squeezed out of the syringe (Fig. 1). In some cases where the patient has difficulty in extending the neck through stridor, it may be advisable to use a shorter needle and divide the injection line into two parts, the needle being first inserted at the suprasternal notch and passed up as far as the thyroid isthmus, while it may again be re-inserted at the level of the hyoid bone to meet the upper limit of the first injection.

GENERAL ANÆSTHESIA AND ITS METHOD OF INDUCTION.

General anæsthesia is always indicated since it avoids pain and shock. Special experience and training is required.

Bellamy Gardner,¹ who has had a large experience in the anæsthetising of laryngeal cases, expresses his opinion as follows: "Chloroform is the only suitable anæsthetic for these cases. It may be quite well administered during induction upon a Skinner's mask until the tracheotomy has been effected, and then continued by means of a Junker's bottle with a long, flexible, leaden tube fitted to its distal efferent end, which should be small enough to rest within the orifice of the tracheotomy tube without obstructing the expiratory tidal airway. I think it necessary to point out very distinctly that an *orthopnoic* patient—that is, one who is unable to lie down owing to dyspnoea—is in danger of complete obstruction under chloroform if laid down flat at any moment until the trachea has been opened. This should be obvious, but is frequently forgotten, as if the orthopnoea were a fancy on the part of the patient and not the dire necessity which it undoubtedly is. A small mouth-prop should be inserted between the teeth before the induction of anæsthesia, and a tongue-clip should be at hand in case laryngeal obstruction supervene. Gauze tampons around and above the tracheotomy tube form a more secure plug than the sponge packing of Hahn's tube. I think it far better to leave the tracheotomy tube *in situ* for twenty-four hours after the operation, as I have known one patient drowned by after-hæmorrhage in the night whose tube had been removed at once. There is no objection to inducing anæsthesia in the propped-up position; but great care must be observed in lowering these patients and especially in extending the neck backwards, which is apt to tighten the vocal cords and produce

¹ Personal communication to author.

complete respiratory obstruction. There should certainly be no undue delay in opening the trachea, though I have known it take the best part of an hour when all the latest ritual practices had been observed."

The warmed vapour of chloroform and oxygen is recommended by some anæsthetists, and is best administered by means of a special apparatus as used by Hughes Phillips¹ or by the very useful apparatus designed by Shipway.²

Chevalier Jackson advocates the use of intratracheal insufflation of ether on the grounds that it dispenses with a tracheotomy tube, allows a shorter incision—thereby saving time—and regulates better the anæsthetic, so that the cough reflex can be stimulated or controlled at the will of the anæsthetist during the operation.

The serious objections, however, to a short incision, the operative risk of performing laryngo-fissure without a preliminary tracheotomy, and the safer method of controlling and regulating the cough reflex by means of local injections and applications of cocaine will be dealt with later in this paper. Ether alone, or in combination, by irritating the mucous membrane, greatly increases the tracheal and bronchial secretions and should be avoided.

LOCAL INFILTRATION ANÆSTHESIA.

Laryngo-fissure can be performed under local anæsthesia, and it has been recommended, amongst others, by Bruns (Berlin), Kocher (Berne), and Edmund Meyer (Zurich). A number of cases have been reported in which the operation has been successfully carried out, but it is a severe ordeal, especially to sensitive patients, and a considerable strain to the operator. Cocaine cannot remove fear from a patient and the resulting shock to the nervous system.

StClair Thomson³ has performed one operation under eudrenine infiltration anæsthesia and cocaine swabbing of the larynx. In exhibiting the case at the Royal Society of Medicine in 1903 he remarked that "the operation under local anæsthesia, *qua* the operation, was infinitely preferable to that under general anæsthetic, for it was easy to get the patient to cough, which was useful at certain times to prevent the blood and mucus from going the wrong way; but on the other hand, the mental and moral strain was much greater under local anæsthesia, both to surgeon and patient.

During recent years, however, improvements in operative posture, gauze tamponage of the trachea, and cocaine injections into the larynx and trachea have done away with these difficulties under general anæsthesia.

POSTURE OF THE PATIENT DURING OPERATION.

The most satisfactory position is one which not only prevents the entrance of blood into the trachea and bronchi, but also any mucus or other secretions from the pharynx entering the larynx (Fig. 18). It should, at the same time, be a position which causes least congestion of the vessels of the head and neck.

In the Trendelenburg position, which is used by some operators, the operating-table is tilted in such a way that the patient lies at an angle of 35 or 45 degrees with the pelvis and lower part of the abdomen raised,

¹ "Apparatus for administering Oxygen with Ether and Chloroform," "Proc. Roy. Soc. Med.," 1917, xi (Sect. Anæsth.), p. 13.

² "Administration of Warm Anæsthetic Vapours," *Lancet*, 1916, i, p. 70.

³ "Proc. Laryngol. Soc. Lond.," 1903, ii, p. 68. "Proc. Roy. Soc. Med.," 1910, iii (Clinical Sect.), p. 120.

whilst the head and shoulders are lower than the level of the body to the extent that all fluids gravitate from the larynx and trachea. In the Rose or hanging-head position the patient's shoulders, after induction of anæsthesia, are drawn to the end of the table and elevated by a firm cushion, whilst the head is allowed to hang over the end of the table, firmly grasped on each side by an assistant's hands in order to steady and keep it in the middle line (Figs. 14 and 15). This position is commonly used for performing a low tracheotomy, especially in patients who have a short, fat neck. Chevalier Jackson uses the Trendelenburg-Rose position, which is a combination of these two positions. The advantage of these positions is that there is little danger of an aspiration pneumonia following the operation.

The objection, however, to these two positions is that the veins of the head and neck become distended with blood owing to gravitation, and considerable oozing of blood may consequently occur in the operation field, thus impeding the view of the parts. The difficulties of hæmorrhage occurring during removal of the growth has frequently been referred to by writers, though Butlin¹ says he had never seen bleeding which could cause the least anxiety. The position recommended is one in which the patient is placed on the back on the operating-table, whilst the shoulders are elevated by a firm cushion; this brings the head into full extension. A second cushion or sand-bag is then placed under the neck in order to raise it and cause the structures on its anterior aspect to become stretched and prominent (Fig. 18).

This is the ideal position and the one advised for thyro-fissure, since it is more comfortable for the operator to work in this position and less dangerous to the patient.

Chevalier Jackson has pointed out that while blood can be aspirated up the inclined closed trachea, it is impossible for it to be aspirated along an open trough—*e.g.* the opened larynx; so that with the head, neck, and shoulders in this position it is apparent that there is little risk of any blood entering the trachea and lungs (Fig. 21).

(To be continued.)

SOCIETIES' PROCEEDINGS.

ROYAL SOCIETY OF MEDICINE—LARYNGOLOGICAL SECTION.

March 2, 1917.

President: MR. T. MARK HOVELL.

(Concluded from p. 153.)

A Series of Twenty-four Foreign Bodies removed from the Air and Food Passages, with Indications as to the Lessons to be derived from some of the Exhibitor's Experiences.—Herbert Tilley.—The point accentuated in certain specimens in this series is the one raised by Dr. Irwin Moore—*viz.* that it is inadvisable to use blind instrumentation for the removal of foreign bodies from the air and food passages.

In one of the patients I was asked to remove a coin from the upper

¹ "The Operative Surgery of Malignant Diseases," 1900, p. 191.