mucous membrane was studded with small nodular elevations, many of which were of a yellowish-white colour, and on section showed central necrosis and caseation. In the immediate surrounding ulcers of varying size were scattered about the mucous membrane. These had infiltrated and somewhat irregular edges, and their bases were composed of minute yellow caseous nodules. Crops of minute tubercles were found beneath the serous peritoneum, each surrounded by a hyperaemic zone, and the lymphatic vessels showed evidences of blocking by tuberculous infiltration. The mesenteric glands were found tuberculous in 3 cases.

These results bear out the observations made by pathologists on the Continent, and in the presence of so great a number of necropsies are of great importance in regard to the frequency of primary intestinal tuberculosis. They bear out, further, the views now generally recognized in regard to the invasion of the intestine by micro-organisms. The invasion of the alimentary canal under natural conditions by micro-organisms is by no means an established fact. In fact, there appears to be reason to doubt such an occurrence. Although the intestinal canal is the seat of election of the causal agents of a large number of diseases, yet the general results of all observations and experiments seem to show that under ordinary conditions the intestinal tract resists to a great extent the invasion of micro-organisms. The danger of auto-infection through the normal intestine appears to have been exaggerated, particularly in regard to the production of general disease in children. The researches of Czerny and Moser¹ are confirmative of this, and, according to Fischl,² most generalized diseases in children do not take origin from the intestine but from the respiratory tract. That such a condition of affairs is met with in tuberculosis in children I have been able to convince myself. By far the majority of cases of tuberculous disease amongst children in Hong Kong arise in connexion with the lungs and mediastinum. The investigations of Nocard and Kaufmann³, Lewin⁴, Wassilieff Kliemann⁵, and others, endeavouring to demonstrate the sieve-like structure of the intestine and its invasion by micro-organisms, would appear to be considerably weakened by the careful experiments of M. Neisser⁶ showing the resistance of the alimentary canal to the invasion of micro-organisms during normal processes of digestion and even after severe mechanical and chemical injuries to the intestinal mucous membrane.

These results have been confirmed by Simoncini¹⁰ and Tschistovitsch¹¹. At the present time it would appear advisable to take up something of an intermediate position in regard to the invasion of the intestine by micro-organisms. At the same time, the conditions in the intestine are remarkable when one considers that there is no other part of the body which is so closely and permanently in contact with such a rich bacterial flora.

It is said that although primary intestinal tuberculosis is a rarity, primary tuberculous disease of the mesenteric glands is by no means uncommon. The results of investigations from English and German sources are forthcoming, showing that this condition is found in a small percentage of cases. Woodhead¹² found it in 14 per cent. of all cases of tuberculosis in children. Biedert¹³ found it 40 times in 1,346 necropsies of tuberculous children; Carr¹⁴ 5 times in 120; and Grawitz¹⁵ in Griefswald 4 times out of 1,104 necropsies. Schlossmann¹⁶ and some others, however, believe tuberculosis of the mesenteric glands to be quite as rare as primary intestinal tuberculosis. My own observations would seem to show that the mesenteric glands are more rarely the seat of tuberculous disease than is generally acknowledged. During the past two years, in the presence of an enormous amount of pathological material, the outcome of over 5,000 necropsies shows 5 cases only of this condition. In each case the naked-eye appearances were supplemented by histological examination. In all of the cases the presence of tuberculous disease was found elsewhere in the body, most frequently in the lungs or lymphatic glands in the mediastinum. In no case was there evidence of tuberculous infection through the intestinal mucous membrane. The intestines were normal to the naked eye in each case. In one case acute generalized miliary tuberculosis was present, and the peritoneum was found scattered over with small tubercles. In another case the peritoneum was also tuberculous, but here the process was accompanied by thickening of the membrane, and the viscera were covered with a pearly-coloured layer, in which were found caseous tuberculous nodules.

Again, on performing a large series of necropsies on children one frequently comes across enlargement of the

mesenteric glands. The appearances in some of the cases are on superficial examination suggestive of the condition known as "tabes mesenterica." I have often experienced difficulty in regard to these cases, and had to resort to careful microscopic examination before pronouncing them free from tuberculous disease.

From my own cases one is hardly justified in concluding that the infection took place by way of the intestine. As has already been mentioned, the normal intestinal mucous membrane offers no great opportunities for the penetration of micro-organisms. The presence of tuberculous disease in other organs—for example, the lungs—allows of the possibility of the transmission of the causal agent from the latter to the mesenteric glands.

CONCLUSIONS.

My results would appear to justify the following conclusions:

1. That primary tuberculosis of the intestine is rare in children under 5 years of age.
2. That tuberculosis of the mesenteric glands is also rare.
3. That the results obtained amongst a native population where tuberculosis in all its forms is rife, and the conditions of life extremely favourable for the dissemination of the disease, point to the alimentary canal as a rare avenue through which infection in tuberculosis is conveyed in childhood.

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INTUBATION IN LARYNGEAL DIPHTHERIA.

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I.

ALTHOUGH a number of informing articles have appeared in recent years, notably one of great practical value by Goodall,¹ intubation of the larynx in diphtheria does not seem, in this country, to have received that recognition which, with due regard to its limitations, it deserves. A consideration of a series of cases is therefore perhaps permissible.

During the period covered by this paper, every laryngeal case requiring operation was treated, in the first instance at least, by intubation, and this absence of selection will, we believe, be of value in discussing the differentiation of cases suitable respectively for intubation and tracheotomy. In this connexion it should be said that intubation was not lightly undertaken; in almost every instance the obstruction was such that immediate interference was necessary. A few cases of a toxic and therefore unfavourable type were, however, intubated because, with only moderate obstruction, there was general loss of ground (see Group E).

We have thought it advisable to outline every case briefly as the best method of giving point to the principles considered in the body of the paper.

O'Dwyer's tubes, either all metal or vulcanite-coated, were used.

Approaching the cases from the point of view of the clinician, who has to decide whether an operation is necessary and also to choose between intubation and tracheotomy, we have arranged them in five groups. They are 70 in number. In stating the time during which the tube was worn, in every case the first day is counted as one.

GROUP A.

Cases not Intubated on Admission, but after a Varying Time for Progressive Obstruction; Twenty-three Cases, with Six Deaths.

CASE I.—M. E. W., female, 17 months. Eighth day. Extensive membrane on tonsils, palate and uvula; profuse nasal discharge. Broncho-pneumonia (right). Antitoxin 12,000 units. Intubated twelve hours later; relief complete. Removed on fourth, fifth, and finally on sixth day. Death on same day from broncho-pneumonia and toxæmia.

CASE II.—M. G., female, 10 years. Second day. Membrane both tonsils. Antitoxin, total dose 26,000 units. Intubated sixteen hours later. Relief not complete. Tube twice removed and cleaned. Death from broncho pneumonia thirty-six hours later.

CASE III.—N. G., female, 2 years. Third day. Extensive pharyngeal membrane. Broncho-pneumonia (left). Total dose of antitoxin 40,000 units. Intubated after twenty-four hours. Relief complete. Tube pulled out by child. Replaced after an hour and a-half. Removed on sixth day. Reintubated after some hours. From now until thirteenth day, especially after eleventh day, tube frequently coughed up (on one occasion swallowed and passed by rectum), reintubation being always shortly necessary. Tracheotomy. Could not do without tracheal tube until thirty days later. Recovery.

CASE IV.—C. J., female, 3 years. Second day. Membrane on both tonsils. Glands enlarged on both sides. Total dose antitoxin 28,000 units. Intubation after five hours. Relief complete. Removed on third day. Recovery.

CASE V.—W. B., male, 17 months. Third day. Membrane on both tonsils. Total dose antitoxin 26,000 units. Intubated after six hours. Relief complete. Extubated on fifth day. No further laryngeal trouble at that time. Numerous complications (otitis, mastoid abscess, persistent albuminuria, etc.). Second attack of diphtheria in eighth week, with laryngeal obstruction. Intubated with complete relief, but died on following day from exhaustion.

CASE VI.—R. M., female, 4 years. Seventh day. Membrane on one tonsil. Enlarged glands. Antitoxin 16,000 units. Intubation after four hours. Relief complete. Extubated on fourth day. Recovery.

CASE VII.—R. W., female, 1 year. Third day. Membrane on both tonsils. Antitoxin 14,000 units. Intubation after three hours. Relief complete. Removed after eight hours for blocking; replaced. Extubated fifth day. In an hour and a half extreme obstruction; reintubated. Same occurrence on ninth day. After that frequently coughed up until fourteenth day. Tracheotomy. Death twenty-four hours later.

CASE VIII.—D. G., female, 2 years. Second day. Total dose antitoxin 24,000 units. Intubated after eighteen hours. Relief complete. Tube blocked twelve hours later. Removed. Recovery.

CASE IX.—E. W., female, 2 years. Ninth day. Remains of membrane on uvula. Antitoxin 16,000 units. Intubated after eighteen hours. Coughed up tube twice on same day and once next day, when it was left out for four hours. On third day twice removed and cleaned. Condition much worse. Tracheotomy. Death ten hours later.

CASE X.—F. M., male, 14 months. Said to be first day. Fauces congested, no membrane. Some bronchitis. Antitoxin 16,000 units. Intubation after two hours. Relief complete. Extubated on fourth day. Slight recession for next forty eight hours. Recovery.

CASE XI.—R. S., female, 4 years. Seventh day. Membrane both tonsils. Pneumonia (right). Antitoxin 16,000 units. Intubation after three hours. Complete relief; sixteen hours later sudden cyanosis and collapse. Tube removed. Artificial respiration necessary. No further laryngeal trouble. In second week recurrence of pneumonia. Death on eighteenth day after admission.

CASE XII.—W. H., male, 1 year. ? Third day. Membrane on both tonsils. Broncho-pneumonia. Total dose antitoxin 24,000. Intubated after eight hours. Complete relief. Extubated sixth day. Recovery.

CASE XIII.—L. C., female, 5 years. Third day. Exudation on both tonsils. Slight bronchitis. Total dose antitoxin 24,000 units. Intubated some hours after admission. Relief complete. Extubated on fifth day. Recovery.

CASE XIV.—R. S., male, 11 months. Fifth day. Glands enlarged on both sides. Antitoxin 12,000 units. Intubated after four and a half hours. Relief practically complete. Coughed up much mucus and small pieces of membrane. Slight recession for first three days. Much cough. Extubated sixth day. Recovery.

CASE XV.—C. W., male, 19 months. History vague. Nasal discharge. Broncho-pneumonia. Total dose antitoxin 26,000 units. Intubation after two and a half hours. Relief complete. Extubated ten hours later for blocking. Reintubated in fifteen minutes. Finally extubated on sixth day. Recovery.

CASE XVI.—B. B., 5 years. Tenth day. Antitoxin 10,000 units. Intubated after two hours. Relief complete. Extubated on fifth day. Recovery.

CASE XVII.—I. L., female, 5 years. First day. Membrane on one tonsil. Total dose antitoxin 18,000 units. Intubated after seven hours. Relief complete. Extubated after thirty-six hours. Recovery.

CASE XVIII.—S. H., male, 4 years. Severe pharyngeal case. In sixth week attack of measles. On eighth day of attack laryngeal diphtheria. Intubation. Extubated on fourth day. Reintubated fifth day. Tube coughed up a few hours later. Steam tent for a few days. Recovery.

CASE XIX.—L. G., female, 5 years. Severe pharyngeal case. Measles in sixth week. On twelfth day of measles second attack of diphtheria, involving larynx. Intubation. Complete relief. Extubated fourth day. Recovery.

CASE XX.—E. C., male, two years. Fourth day. Total dose antitoxin 42,000 units. Intubation after six hours. Extubated on fourth day. Some recession. In steam for two days. Recovery.

CASE XXI.—J. B., male, 3 years. Third day. Membrane on right tonsil; slight broncho-pneumonia. Total dose antitoxin 40,000 units. Intubated after twenty-four hours. Relief not complete until some hours later. Extubated fifth day. Transient return of obstruction two days later with antitoxin rash. Put in steam. Recovery.

CASE XXII.—A. H., male, 3 years. Fourth day. Total dose antitoxin 32,000 units. Intubated after four hours. Restless for a quarter of an hour. Relief then complete. Extubated third day. Recovery.

CASE XXIII.—E. E. W., female, 5 years. Sixth day. Total dose antitoxin 30,000 units. Intubated after eight hours. Relief complete. Extubated after thirty-six hours. Some uneasiness. Steam for two days. Recovery.

GROUP B.

Cases Admitted with Moderate Obstruction Requiring Intubation at a Subsequent Time for a Paroxysmal Exacerbation; Two Cases with no Deaths.

CASE XXIV.—C. R., male, 4 years. Fourth day. Traces of membrane on tonsils. Antitoxin 12,000 units. Intubated three hours after admission during an attack of severe obstruction with cyanosis, following a fit of coughing. Tube coughed up in twenty minutes. Recovery.

CASE XXV.—R. W., female, 3 years. Second day. Exudation on right tonsil. Total dose antitoxin 24,000 units. One hour after admission, urgent obstruction with cyanosis. Intubation. Complete relief. Coughed up tube and large piece of membrane two hours later. Recovery.

GROUP C.

Cases Admitted with Obstruction already sufficiently Developed to require Immediate Operation; Thirty-seven Cases, with Eleven Deaths.

CASE XXVI.—M. B., female, 1 year. Fifth day. Slight glandular enlargement. No membrane on fauces. Relief complete. Some evidence of broncho-pneumonia. Antitoxin 12,000 units. Twenty-three hours later medical officer urgently summoned. Found child dead. The tube was not blocked. The sister's report pointed to sudden heart failure without obstruction.

CASE XXVII.—V. S., female, 16 months. Supposed second day. Membrane on tonsils and uvula. Profuse sanguineous nasal discharge. Relief complete. Total dose antitoxin 32,000 units. Extubated during first twenty-four hours for blocking; tube at once returned. Extubated fourth day. Recovery.

CASE XXVIII.—F. S., male, 18 months. Sixth day. Membrane on both tonsils. Relief complete. Considerable broncho-pneumonia. Antitoxin 12,000 units. Extubated after twelve hours for blocking; left out nine hours. Extubated on third day; at once reintubated. Extubated fifth day; tube left out two hours. Finally extubated seventh day. Recovery.

CASE XXIX.—V. F., female, 3 years. Duration doubtful. Membrane on both tonsils. Broncho-pneumonia both sides. Relief complete. Total dose antitoxin 18,000 units. Extubated on second, fourth, seventh, eleventh, thirteenth, eighteenth, twenty-first, twenty-fifth, and thirtieth days, obstruction returning after periods varying from two to seventeen hours. On thirty-first day finally removed, with use of chloral and bromide draught and steam. For several days paroxysmal obstruction still occurred. Recovery.

CASE XXX.—A. J. M., male, 2 years. Sixth day. Relief complete. Antitoxin 20,000 units. Respiration and pulse increased during second and third days. On fourth day obstruction returned. Extubated and reintubated without relief. Tracheotomy, also without relief. Death two hours later.

CASE XXXI.—T. L., male, 2 years. Second day. Membrane on both tonsils. Complete relief. Total dose antitoxin 22,000 units. Extubated twice on second day, tube filled with mucus. Finally extubated on seventh day. Recovery.

CASE XXXII.—J. D. W., male, 4 years. Sixth day. Membrane on tonsils and soft palate. Profuse nasal discharge. Glands much enlarged. Pulse feeble, extremities cold. Complete relief. Total dose antitoxin 28,000 units. Epistaxis. No urine passed. Death after eleven hours from toxæmia.

CASE XXXIII.—F. J. T., male, 20 months. Third day. Slight exudation on right tonsil. Relief complete. Total dose antitoxin 40,000 units. Extubated sixth day. Four days later dyspnoea and recession with some cyanosis. Reintubated. Tube coughed up three times in next six days. On last occasion not replaced. Recovery.

CASE XXXIV.—E. T., female, 6 years. Eighth day. Advanced toxæmia. Relief complete. Total dose antitoxin 32,000 units. Death in thirty-six hours from toxæmia.

CASE XXXV.—E. N., male, 2½ years. Third day. Some exudation on both tonsils. Relief complete. Antitoxin 16,000 units. Extubated fifth day. Some recession on same evening, soon passing off. Recovery.

CASE XXXVI.—L. B., female, 2 years. Third day. Profuse nasal discharge. Sloughy, blood-stained exudation on both tonsils. Glands slightly enlarged. Relief complete. Total dose antitoxin 36,000 units. Tube removed on third and fourth days, left out for six and three hours respectively. Finally removed on sixth day. Same evening considerable recession, passing off in twenty-four hours. Recovery.

CASE XXXVII.—E. S., female, 3 years. Eighth day. Severe toxæmia. Membrane on both tonsils. Haemorrhage from nose and pharynx; purpura. First insertion seemed to block larynx entirely. On withdrawal, a large sloughy piece of membrane found on lower end of tube. Reinserted. Immediately coughed up. Again inserted, with complete relief. Eighteen hours later tube blocked and removed. No return of obstruction. Death from toxæmia on same day.

CASE XXXVIII.—H. J. E., male, 2 years. Third day. Membrane on right tonsil. Relief complete. Total dose antitoxin 32,000 units. Extubated fifth day. Recovery.

CASE XXXIX.—K. B., female, 19 months. Fourth day. Membrane on both tonsils. Relief complete. Total dose antitoxin 40,000 units. Tube coughed up twice on second day. Extubated on third, fourth, and fifth days. Longest period without tube three hours. Finally extubated on sixth day. At end of fourth week perichondrial abscess. Incision and drainage. Recovery.

Note.—During this period we had a case of perichondrial suppuration in which intubation had not been performed, and another more recently.

CASE XL.—L. C., female, 3 years. Second day. Enlarged glands on both sides. Complete relief. Total dose antitoxin 32,000 units. Tube removed and replaced on second day. On third day, violent cough and

recession. Tube removed: complete membranous cast of trachea coughed up. Not reintubated. Recovery.

CASE XLII.—R. J. W., male, 3 years. Seventh day. Complete relief. Antitoxin 20,000 units. Extubated on fourth day. Recovery.

CASE XLIII.—M. H., female, 2 years. Fourth day. Relief complete. Antitoxin 12,000 units. On second day colour bad, pulse and respirations increased in speed. Tube removed. Three hours later tracheotomy performed. Death in nine hours.

CASE XLIII.—M. V., female, 2 years. Second day. Complete relief. Total dose antitoxin 32,000 units. On third day restlessness and some recession, then, during nasal feed, sudden cyanosis. Tube removed and tracheal cast 1 in. long coughed up. Recovery.

Note.—This case is interesting in view of the fact that in rare instances sudden death occurs during nasal feeding.

CASE XLIV.—R. N., male, 12 months. Second day. Complete relief. Total dose antitoxin 24,000 units. Occasional slight recession. Extubated seventh day. Slight recession for twenty-four hours. Recovery.

CASE XLV.—H. O., male, 4 years. Second day. Nasal discharge and glandular enlargement. Complete relief. Total dose antitoxin 32,000 units. Rather frequent cough. On second day urgent dyspnoea and recession. Tube removed and complete cast of trachea coughed up, including bifurcation. Same event on third day, the cast being less complete, but showing bifurcation. Removed on fourth day for same reason, and some large flat pieces of membrane coughed up. Extubated on fifth and finally on eighth day. Recovery.

CASE XLVI.—M. A. S., female, 2 years. Sixth day. Broncho-pneumonia both sides. Relief complete. Total dose antitoxin 28,000 units. Extubated sixth day. Three days later some recession and restlessness passing off in a few hours. Recovery.

CASE XLVII.—D. E. G., female, 4 years. History not known. Complete relief. Total dose antitoxin 26,000 units. Extubated fifth day. Some recession and occasional dyspnoea for some days. Recovery.

CASE XLVIII.—C. S., male, 7 years. Third day. Glands moderately enlarged on both sides. Relief complete. Total dose antitoxin 26,000 units. Extubated on fourth day. Recovery.

CASE XLIX.—M. T., female, 7 years. Complete relief. Coughed up after eighteen hours. Replaced. Coughed up a few hours later. Recovery.

CASE L.—R. F. B., male, 3 years. Third day. Diphtheria following measles. Complete relief. Antitoxin 18,000 units. Extubated on third day. Recession afterwards, gradually increasing. Steam for two days. Recovery.

CASE LI.—B. S., female, three years. Duration doubtful. Relief not quite complete. Steam tent. Antitoxin 10,000 units. On second day tube coughed up with small piece of membrane. Reintubated. Still some recession, increasing on second evening. Tracheotomy. No membrane could be extracted at operation. Death seven hours later.

CASE LII.—C. S., female, 4 years. Second day. Relief complete. Antitoxin 12,000 units. Extubated on sixth day. Recovery.

CASE LIII.—H. P., female, 3 years. Second day. Relief complete. Antitoxin 12,000. Extubated fourth day. Recovery.

CASE LIV.—J. P., female, 12 months. History vague. No pharyngeal membrane. First insertion gave no relief. On withdrawal complete cast of larynx found attached to tube. Relief complete on second insertion. Total dose antitoxin 24,000 units. Temperature, pulse, and respiration rose during day, and obstruction returned and increased. Tube removed, cleaned, and replaced without relief. Tracheotomy. On inserting tube respiration ceased entirely. By forceps, on second attempt, complete cast of trachea removed showing bifurcation and several secondary branchings, nearly 4 in. long. Artificial respiration; death fifteen hours after admission.

CASE LV.—F. W., male, 3 years. Third day. Membrane on one tonsil. Relief complete: tube coughed up in a few minutes without return of obstruction. Total dose antitoxin 56,000 units. Reintubated six hours later. On second day obstruction returned. Tracheotomy. Death six hours later although relief complete.

CASE LVI.—N. H., female, 5 years. Fourth day. Membrane on both tonsils. Relief considerable but not complete. Antitoxin 10,000 units. Recession increased on same day. Extubated and put in steam tent. On third day some obstruction still present. Tracheotomy. Complete relief. Tube worn for more than a month. Recovery.

CASE LVII.—C. R., male, 5 years. Third day. Fauical congestion. Complete relief. Total dose antitoxin 23,000 units. After three hours tube blocked and removed. Reintubated six hours later. Cast of larynx found in mouth. Finally extubated on fifth day. Recovery.

CASE LVIII.—G. A. B., male, 11 months. History doubtful. Membrane on right tonsil. Glands affected on both sides. Slight broncho-pneumonia. Relief complete. Total dose antitoxin 35,000 units. Tube coughed up on third day. Replaced. Extubated fifth day. Reintubated in three-quarters of an hour. Coughed up on seventh day (twice) and again on eighth day, when it was not replaced. Recovery.

CASE LIX.—J. U., male, 1 year. Second day. Membrane on both tonsils. First insertion gave no relief. Stridulous sound suggested loose membrane below tube. Second insertion gave complete relief after about a quarter of an hour. Total dose antitoxin 28,000 units. Second evening obstruction returned, with rising temperature. Tracheotomy. Obstruction not relieved; no membrane could be extracted. Death twenty-six hours after admission.

CASE LX.—H. D., male, aged 22 months. Third day. Complete relief. Antitoxin intravenously 11,000 units, subcutaneously 10,000 units. Extubated fourth day. Some recession and dyspnoea. Put in steam for three days. Recovery.

CASE LXI.—G. T., male, 7 years. Sixth day. No faucial exudation. Severe broncho-pneumonia. Relief great but not quite complete. Tube removed after eight hours. Not found necessary to replace it. After four days slight obstruction, passing off in a few hours. Broncho-pneumonia gradually spread and caused death on sixteenth day.

CASE LXII.—M. M., female, 3 years. Second day. Complete relief: Broncho-pneumonia. Total dose antitoxin 30,000 units. After twelve hours tube blocked; removed. Cast of trachea, which included bifurcation, found in mouth. Reintubated. Fourteen hours later tube blocked; removed; replaced in half an hour. Extubated on fourth day; reintubated in a few hours. Extubated on seventh day; reintubated in ten hours. Tube coughed up once on each of next two days. Next day (tenth) medical officer urgently summoned. Found patient apparently dead, tube having been coughed up. Tracheotomy. Artificial respiration. Recovery. Still wearing tube five months later, although there is some entrance of air by larynx and the voice is good.

GROUP D.

Cases admitted in extremis: Six Cases with Three Deaths.

CASE LXIII.—W. T., male, 6 years. Sixth day. Extremely toxic case; some laryngeal obstruction. Tube pulled out by patient immediately after first insertion. Replaced at once. Complete relief. Antitoxin 14,000 units. Death in eight hours from toxæmia.

CASE LXIV.—J. R., male, 4 years. Third day. First insertion seemed to block the larynx entirely. Tube withdrawn. Second insertion gave complete relief. Extensive broncho-pneumonia on both sides. Total dose antitoxin 32,000 units. During next eighteen hours tube blocked with mucus and removed five times. During last reinsertion respiration stopped. Tracheotomy, artificial respiration, death.

CASE LXV.—A. B., female, 4 years. Fourth day. Membrane on both tonsils. Relief complete. Total dose antitoxin 36,000 units. Tube coughed up once and removed once in the next twenty-four hours. Extubated on fifth day; reintubated in one hour. Finally extubated on ninth day. Recovery.

CASE LXVI.—H. R. S., male, 15 months. Second day. Almost moribund. Relief on intubation not quite complete. Tube coughed up twice. Tracheotomy. Death sixteen hours after admission.

CASE LXVII.—G. B., male, 4 years. Third day. Almost moribund. Respiration stopped a few seconds after first insertion; tube withdrawn: tracheotomy; artificial respiration. No membrane found in trachea at operation, but next day large sloughy mass withdrawn with forceps. Total dose of antitoxin 40,000 units. Recovery.

CASE LXVIII.—E. A. J., male, 3 years. Second day. Slight faucial exudation. Almost moribund. Relief complete. Total dose of antitoxin 32,000 units. Tube coughed up on fourth day. Recovery.

GROUP E.

Cases with only Moderate Obstruction, but with Progressive Asthenia, and especially a Tendency to Circulatory Failure; Two Cases, One Death.

CASE LXIX.—H. C., male, 2 years. Fourth day. Extensive membrane, much pharyngeal swelling, profuse nasal discharge, glands much enlarged. Antitoxin 20,000 units. Some obstruction continued with general loss of ground till sixth day. Intubation on this day. Complete relief of obstruction. Extubated third day; immediately reintubated. From now till the twelfth day, especially after ninth day, frequent coughing up of tube, always with urgent obstruction within a few minutes. Tracheotomy. Seven days later death from syncope.

CASE LXX.—M. K., female, 4 years. Fourth day. Very extensive pharyngeal membrane, profuse nasal discharge. Total dose antitoxin 36,000 units. Intubated after twenty-four hours. Complete relief. After eighteen hours tube blocked and removed. Same occurrence twenty-four hours later, distress developing quickly in each case. Extubated sixth day; reintubated in a quarter of an hour. Extubated three more times up to thirteenth day. From then till eighteenth day tube very frequently coughed up, urgent obstruction always quickly developing. Tube retained after this, but every attempt to leave it out failed. On thirty-second day removed under chloroform. After twenty-four hours gradual increase of obstruction. Tracheotomy on thirty-fourth day. Tube worn for four months. Recovery.

II.

It is unnecessary to enter into the ordinary clinical indications for operation; to them may be added those obtaining in Group E. It being decided that an operation is necessary, the question of the relative advantages of intubation and tracheotomy arises. It may be said at once that the choice primarily depends on the surroundings of the individual case, for the post-operative emergencies requiring the immediate presence of a medical man are far more frequent with intubation (see, for instance, Cases III, XLIII, XLV, LVIII) than with tracheotomy; difficulties following the latter can generally be dealt with, temporarily at least, by the trained nurse. Hence it is plain that tracheotomy is preferable in private practice. In hospital, where constant medical attendance is assured, intubation has the general advantage of throwing less work on the nursing staff, both in preparation and after-treatment.

Passing to the intrinsic value of the two operations, intubation is in our opinion easier to perform, after a little experience. Apart from secondary inflammatory conditions we have only failed to insert the tube in one case, which was not

diphtheria. It must be admitted, however, that in rare cases of diphtheria, oedema may render intubation impossible; it is a cardinal rule that no force must be used when inserting the tube. Against the dangers of tracheotomy, which even the experienced operator may encounter, are to be placed, in the case of intubation, the partial asphyxiation from gagging and inserting the tube (see Case LXIV), and the possibility of actual blocking of the trachea by dislodged membrane (see Cases XXXVII, LXVII). These exigencies are, however, rare, and when they occur seldom cause death. If necessary tracheotomy can be performed. The operator should see beforehand that the essential instruments are at the bedside. Case LXIV is the only one where death occurred at the time of intubation; it seemed to be due rather to cardiac failure than to obstruction—the more so as the previous insertions, excepting the first, had been effectual.

We do not propose to discuss the mortality of the two operations; it will suffice to say that at this hospital the death-rate for intubation, including cases subsequently requiring tracheotomy, is 30 per cent., against a somewhat higher rate for primary tracheotomies. In appraising the value of operation it must be remembered that even with the obstruction relieved death may occur from a variety of other causes (see, for example, Cases v, xi, xxxiv, etc.).

In view of the foregoing considerations we should ourselves, as a rule, choose intubation, in the absence of clinical contra-indications. Among conditions which at one time or another have been so considered are:

(a) *Severe Involvement of the Fauces and Nasal Passages.*—The fact that enlargement of the cervical glands, tonsillitis and nasal obstruction may, in very exceptional cases, make tracheotomy necessary is recognized. That there may, however, be extensive pharyngeal and nasal involvement and intubation yet completely relieve is shown by Cases i, iii, xxvii, xxxii, xxxvi, lxix, lxx. Their subsequent history (3, out of the 5 which survived the first few days, requiring tracheotomy under conditions pointing to ulceration) nevertheless suggests that cases of this class may be unsuitable for intubation, not necessarily because the operation may fail to relieve, but rather owing to a special vulnerability of the tissues. We are inclined to believe that such vulnerability is a characteristic of septic cases in which the mixed infection extends to the larynx. The two last-named cases illustrate this. We do not think that in ordinary severe faucial and nasal cases intubation is often contra-indicated. If there be severe toxæmia, such as is marked by a general tendency to bruising on slight pressure, it is natural to suppose that the larynx will share in it and a liability to ulceration result. In such cases it will be necessary to weigh the risks of tracheotomy, with or without chloroform, against the possibility of ulceration from the intralaryngeal tube.

(b) *Palpable Oedema of the Upper Part of the Larynx.*—We have had one case, not in this series, in which a considerable amount was present. Intubation gave relief at first; but after a time, as the child was slowly losing ground, tracheotomy was performed with distinct benefit. Ulceration probably occurred, and must be admitted to be a danger in such cases.

(c) *The Presence of Membrane low down in the Trachea.*—Even if it were possible to make a preliminary diagnosis of this condition with any degree of certainty, its significance as a contra-indication would remain in doubt. Thus, Cases xlv and lxii were completely relieved, although subsequently casts showing the bifurcation of the trachea were coughed up.

(d) *A Moribund Condition Referable to Obstruction.*—Cases are occasionally admitted to hospital in which the necessary delay, slight as it is, and the temporarily increased asphyxiation which intubation involves, are inadmissible. By a coincidence none quite so desperate occurred in the present series. Cases lxv, lxvi, lxvii, and lxviii most nearly approached this condition (see also Case lxii).

The question of extensive broncho-pneumonia as a contra-indication to intubation suggests itself. This complication is a common cause of death in fatal cases of intubation as of tracheotomy. The same holds good, however, in non-operative cases of diphtheria in which the air passages are involved, and we doubt whether intubation in itself has any influence on the course of broncho-pneumonia. If, however, there is much tentacious sputum, intubation may be rendered ineffectual by constant blocking of the tube (see Cases ix, lxiv). Such a contingency cannot well be foreseen, and in point of fact cases may do well with intubation alone, even

though there be considerable pre-existing broncho-pneumonia (see, for example, Cases xxviii, xlvi).

III.

Reference has already been made to immediate blocking during insertion. Of another kind are cases in which intubation only affords partial relief. If the obstruction remain severe tracheotomy will, of course, be required. Otherwise due time should be allowed for the child to settle down (see, for example, Case xxii). When slight obstruction continues, the patient should be carefully watched. Gradual improvement may ensue (see Cases xiv, xxi). If, on the other hand, loss of ground continues, we are of the opinion that tracheotomy is sometimes advisable, even though the obstruction be slight.

Next fall to be considered cases in which intubation relieves completely, but only for a time. This may be due to extension of the membrane (see Cases xxx, liv, lix), repeated blocking of the tube, as already mentioned (see Cases ix, lxiv), or the development of definite intolerance (see Cases iii, vii, lxix, lxx). These are all conditions that demand tracheotomy. In the first-named condition this may or may not relieve, or the relief may be only temporary. In the second more or less complete relief of the obstruction is usual, but the prognosis remains bad. As regards the last, it cannot be doubted that frequent reinsertions are exhausting to the patient, and may possibly cause injury to the larynx.

IV.

The intralaryngeal tube having effectually relieved the obstruction, it will be the aim of the operator to dispense with it as soon as possible. On this point Northrup (Article on Diphtheria in Nothnagel's *Encyclopædia of Practical Medicine*, English edition) remarks that "five days for a child over 2 years of age may be considered a fair average. At the Willard Parker Hospital the time allowed is four days; at the New York Foundling Hospital three days.....According to Somerset.....a child under 2 years of age may require the tube intermittently during a period of two weeks or longer. He puts the limit of time during which the tube should be worn without removal at five days in primary intubations." In our series, excluding cases fatal during the first few days, the tube was coughed up or removed for the first time:

(a) In 9 cases within twenty-four hours; of these, 7 did not require reintubation.

(b) Of 7 cases on the second day only 2 did not require reinsertion.

(c) Of 7 on the third day, 4 did not require reinsertion.

(d) Of 11 on the fourth day, 10 did not require reinsertion.

(e) Of 9 on the fifth day, 8 did not require reinsertion.

(f) Of 7 on the sixth day, 5 did not require reinsertion.

(g) One case on the seventh day did not require reinsertion.

As to the day of final removal, this took place on the first day in 7 cases, on the second day in 2, on the third day in 5, on the fourth day in 10, on the fifth day in 9, on the sixth day in 7, on the seventh day in 3, on the eighth day in 2, on the ninth day in 1, on the tenth day in 1 (tracheotomy, Case lxii), on the twelfth day in 1 (tracheotomy, Case lxix), on the thirteenth day in 1 (tracheotomy, Case iii), on the fourteenth day in 1 (tracheotomy, Case vii), on the sixteenth in 1 (Case xxxiii), on the thirty-first day in 1 (Case xxix), on the thirty-second day in 1 (tracheotomy two days later, Case lxx).

We are of opinion that the tube should be removed on the fourth day at the latest, and left out if it is at all possible. Thus steam and sedatives may be used (for example, Cases xviii, xxiii, etc.). If by the tenth day the tube cannot be dispensed with, we consider that as a rule tracheotomy should be performed. Of the above seven cases in which the tube was retained after the ninth day, five came to tracheotomy, and in the three which survived there was evidence of laryngeal obstruction for a considerable time. In one of the two which did not come to tracheotomy, there was an interval of four days, during which the tube was not worn. Especially should tracheotomy be done if there be definite intolerance.

A review of the cases with "retained tube" shows that they were initially of a severe type: two occurred in the first group, two in the third, and two in the fifth.

As to the method of extubation, we are in agreement with Fairbank² that in most cases the thread should be left attached. It sometimes causes salivation, and may, of course, be bitten through. To prevent the tube being pulled out the hands may be tethered to the sides of the cot, but a better plan is to use cardboard elbow splints, so that the child can

move freely and play with toys. We also endorse Fairbank's objection to enucleation.

REFERENCES.

¹*Edin. Med. Jour.*, March, 1902. ²*Lancet*, June 20th, 1903.

A SUGGESTION FOR THE TREATMENT OF PUERPERAL CONVULSIONS BY SPINAL SUBARACHNOID PUNCTURE.

WITH NOTES OF A CASE SO TREATED.

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OUR knowledge of the etiology and pathology of eclampsia of pregnancy and the puerperium is so unsatisfactory as to afford no rational basis for treatment. In the present state of affairs we must turn to clinical study and to the results of personal experience for guidance. No apology is needed, I think, for venturing to suggest any means of treatment which offers the possibility of relief in this distressing condition.

Whether of mechanical or chemical origin, it is now agreed that the phenomena of eclampsia are largely dependent upon the presence of toxic material in the blood, discussion still going on as to whether this accumulation is the result of deficient elimination, imperfect metabolism, or increased production, or of the introduction of some new toxin foreign to the non-pregnant state. The nature of the toxin is still unknown, nor is there more certainty as to the way in which it produces the eclamptic state.

In the matter of treatment it is agreed that there are three chief indications:

1. To prevent the accumulation and assist the elimination or destruction of the poison.
2. To deal with the pregnancy.
3. To control the convulsions.

And upon each of these there exists a diversity of opinion as bewildering as in the question of causation.

The first indication is scientifically the important one, but at present our methods are purely empirical. It is, however, to the last of these three principles that I wish especially to draw attention; but I may say that my experience coincides with what I believe to be the experience of others—namely, those cases have in my hands done best where the pregnancy has come to an end and the convulsions have been controlled; the worst cases have been those in which the convulsions could not be controlled, and where coma supervened; and I have come to regard the extent to which the nervous system is involved and the success with which this can be controlled as the key to prognosis.

The questions of the management of the pregnancy and of the toxæmia must be dealt with equally, whether we see the case before the occurrence of convulsions or afterwards.

1. *In the Pre-eclamptic Stage* (that is, the stage in which the albumen in the urine may be increasing, while the urea is diminishing in amount, and certain signs and symptoms are appearing, as, for example, headache, oedema, respiratory distress). The first indication is to combat the accumulation of the toxin by dietetic and hygienic measures, attention to the excretions, and possibly the administration of thyroid extract, based on the theory that, owing to thyroid deficiency, tissue metabolism is imperfect. In many cases treatment on these lines succeeds, and pregnancy may run to term; but the anxious cases are those in which the deficiency of urea excretion and albuminuria persist and untoward symptoms intensify; in these cases we have to face the important question of interfering with the pregnancy. If, on the one hand, it is the fact that there is deficient excretion or increased production of effete material directly dependent upon the pregnant state (that is, upon the fact that the maternal organism cannot meet the strain put upon her metabolic processes by the life and growth of the fetus and their consequences), and by appropriate means we are unable to restore the balance, we must consider termination of the pregnancy as an important and integral part of treatment; or if the toxin is some special toxin generated in the gravid womb from placental or fetal faultiness, or some toxin formed in association with the dissolution of deported placental cells (escaped into the maternal blood stream), the same rule holds, though possibly we must eventually rather look to serumtherapy or treatment by antitoxin injections. If, on the other hand, it could be shown that the fault lies in some distant organ,

for example, the thyroid gland, and a remedy can be found by supplying some deficient element of its secretion, a great point would be gained, for interference with pregnancy would become unnecessary. If it should become necessary to terminate the pregnancy, the choice of method is of importance. Formerly I have induced labour by the introduction of bougies and also by the glycerine method of Pelzer, but recently I have employed the more rapid method of dilating by Bossi's dilator. The first and second principles of treatment are bound up together and are of special importance in the preventive treatment of eclampsia, but, once convulsions have set in, the third principle becomes of instant and of first importance.

2. *Eclamptic Stage*.—The first principle of treatment remains in force: it is necessary to get rid of the toxin, and now more active measures must be taken: hot packs, saline injections, and rectal irrigation are of use. With regard to the second principle—the management of pregnancy—there is a great diversity of opinion. Looking upon the continuance of pregnancy as a vital factor in the production of the poison and the causation of this disease, my own practice is to end the pregnancy, whether labour has commenced or not. Truly, the onset and progress of labour by the unaided natural powers, involving much unwonted muscular work and nervous strain, must throw into the system an additional amount of effete material, with which the excretory organs, if already damaged, may be unable efficiently to cope, or the violent uterine contractions may conceivably give rise to further escape of placental cells into the maternal blood-stream, and so intensify the danger. And it is on this account that I personally am of opinion that the right course is not to leave the matter in the hands of the maternal powers, but to terminate the labour as expeditiously and as safely as possible by artificial means. Though much has been said, and possibly rightly said, in favour of abdominal or vaginal Caesarean section, my own practice is as follows:—(1) Where labour has commenced and the os is dilating I chloroform and deliver, if necessary, completing dilatation artificially by hand or instrument. (2) Where labour has commenced and the os is not dilating, or where labour has not commenced, I chloroform and dilate by means of Bossi's dilator and deliver. Formerly I dilated manually, or by hydrostatic bags, but now I prefer Bossi's instrument, which I believe, if carefully used, may be safely used. Possibly the fact that my muscular development is not too great has preserved me from inflicting those serious injuries which apparently have been met with in its use. If dilatation be performed slowly and the cervix carefully watched there should be little danger. But, as I said before, when once convulsions have occurred, whether before, during, or after labour, the third principle becomes of instant importance. It is now essential to control the convulsions, and this is the special point to which I desire to call attention.

The Convulsions.—How are the convulsions caused? Several suggestions have been offered: (1) That they are produced by direct action of the toxin upon the nerve cells, (2) by cerebral anemia, the result of constriction of arterioles, (3) by cerebral oedema, the result of increased arterial tension, (4) by coagulation and capillary thrombosis. A suggestion, which I now advance, is that the eclampsia is due to increased cerebro-spinal tension. If we look at the clinical aspect of a case, we see at once that this suggests intracranial pressure. The premonitory signs of headache, dizziness, irritability and sudden blindness, the clonic, tonic, and tetanic spasm, the stupor and coma, all are consistent with increased intracranial pressure. Whether this be the cause or not, the continuance of the violent convulsions will increase the pressure by causing congestion of the cerebral vessels, and if continued, serous effusion and even hæmorrhages may occur. We have only to think of the picture of the eclamptic woman to see how grave must be the congestion resulting from each attack. If this intracranial pressure be present, and if it be allowed to continue unrelieved, or to increase, it will in all probability lead to death. If the convulsions continue unrelieved, small or large hæmorrhages or other vascular disturbances may occur, and, once this state is reached, the patient will almost inevitably die—these are the cases that end in death, whatever treatment be adopted, and my experience has led me to the conclusion that the tendency to death is proportionate to the extent to which the nervous system is involved. Whilst therefore dealing with the questions of the toxæmia and the pregnancy, it is essential to control the fits.

What Means Have We?—Up to the present time we have