CROUP AND TRACHEOTOMY

IN THE SOUTHERN STATES.

By WILLIAM M. MASTIN, M. D.,

OF MOBILE, ALA.

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THE fallaciousness of figures is too thoroughly recognized to decide the query of necessity for the performance of any surgical operation. Especially has this been observed in tracheotomy for croupous and diphtheritic laryngitis; for the sporadic or epidemical nature of the disease, the complications attending individual attacks, the stage of the malady when the knife is used, the sanitary surroundings of the patient, the varied medical treatment adopted by different men, the season of the year, and the disinclination of operators to record their failures largely diminish the information expected from statistics. Hence tracheotomy, for these forms of laryngitis, is one of the most debated questions in the entire literature of surgery. This indecision is surprising, however, when we consider the unanimity of the profession in regard to the legitimacy of an artificial opening in the trachea in almost all other laryngeal troubles. In the obstructive varieties of catarrhal, erysipelatous, syphilitic, tubercular and the laryngitis of the eruptive fevers (in the tubercular form the extensive pulmonary deposit usually present, makes the malady eminently one of depression, and in that rare inflammation of the larynx, sometimes encountered as a complication of typhoid fever, the constitutional condition is that of pronounced asthenia), in that state known as œdema glottidis, in inflammations of the larynx from traumatism, and from corrosive substances,

there is scarcely a surgeon living who would not advise a prompt re-establishment of respiration by a free opening below the diseased locality; for the admission of air into the lungs is the one point in view. Yet in laryngeal diphtheria the constitutional or systemic condition of the disorder brings up grave objections to the operation, and in many instances the little sufferer is allowed to pass away with all the horrors of a death from apnœa. To reconcile these discrepancies is difficult!

Although statistics are apt to be misleading, and their usefulness is especially impaired when gathered from many sources, they are, at the same time, our main dependence, and the safest guidance we possess in solving any surgical problem. Since the publication last year of a paper on the subject of Tracheotomy for Croup in the United States,[1] there has come to my notice a few additional cases, which are in such direct substantiation of the views therein expressed that I now desire to speak of them in the present article, and with particular reference to the operation in the Southern States.[2] For the sake of brevity I will deal with figures as much as possible, and hastily review the several points of interest which the collected cases present.

The total number of tracheotomies for croup in the United States collated by me to date comprise 903 operations, with 195 recoveries and 708 deaths; but of that number there were found 43 operations in which death was attended by such complications as to justify their exclusion from the general list, and hence the true figures should read—whole number operations, 860; cures 195, and deaths 665, or 1 cure in a little over every 4½ operations (22.67 per cent.).

Of these the cases in the South numbered 72, with 15 cures and 57 deaths, or 1 cure in every 4⅘ cases (20.83 per

[1] Gaillard's Med. Journal, New York. January, 1880.

[2] By Southern States is here meant all States below the 35th degree of latitude.

cent.); and those in the Northern, Eastern and Western States were 831 operations, with 180 cures and 651 deaths, or 1 cure in a little over every 4⅓ cases (a little over 21 per cent.). As would be expected from the sparsely settled country, the greater room and air space accorded to the habitations, and the infrequency of the tenement building in the cities, with the more genial climate, croup and diphtheria are much less prevalent in the strictly Soutl.ern than the Northern and Eastern States, and hence the number of tracheotomies in this section is correspondingly small.

The influence of climate over croup has been found to be decided, notwithstanding its occurrence in all the quarters of the globe. Investigation has shown that it is less frequent as we proceed from the higher latitudes to the tropics, and that moist, cold climates furnish the most favorable conditions for its production.

Taking Mobile and New Orleans as fair examples of the southern section of this country, and the cities of Philadelphia and Brooklyn as representatives of the northeast, let us examine the relation which these disorders manifest towards the respective places. Thus, from an examination of the records of the Board of Health of Mobile, with an estimated population of 40,000, there was found in a period of eight months (May to December inclusive) during the year of 1875, only 3 deaths from diphtheria, and membranous croup 2, with a total death record of 619 (less still-born). In the entire year of 1876 there were 3 deaths from diphtheria and 2 from mem. croup, with a total of 1,120 deaths; in 1877, diphtheria 5, mem. croup 4, and 935 total deaths; in 1878, diphtheria 1, mem. croup 3, with total deaths 922; in 1879, for five months (June to October inclusive), diphtheria 2, mem. croup 1, with total deaths 395; and in 1880 there were diphtheria 1, mem. croup 6, and a total mortuary record of 762. In the city of New Orleans, estimated population

210,000, for nine years from 1870 to 1879 inclusive (less 1876, which is not reported) the mortality record was, in 1870, diphtheria 19, croup 19, total deaths (less still-born) 6,943; in 1871, diphtheria 16, croup 6, total deaths 5,595; in 1872, diphtheria 39, croup 26, total deaths 6,122; in 1873, diphtheria 46, croup 49, total deaths 7,505; in 1874, diphtheria 102, croup 55, total deaths 6,798; in 1875, diphtheria 69, croup 40, total deaths 6,117; in 1877, diphtheria 33, croup 22, total deaths 6,708; in 1878, diphtheria 59, croup 37, total deaths 10,282; in 1879, diphtheria 58, croup 49, total deaths 5,122.

Philadelphia[1] showed for the six years from 1870 to 1875 inclusive, the following mortuary statistics: In 1870, mem. croup 316, diphtheria 172, total mortality (less still-born) 15,317; in 1871, mem. croup 264, diphtheria 145, total deaths 15,485; in 1872, mem. croup 296, diphtheria 150, total deaths 18,987; in 1873, mem. croup 200, diphtheria 110, total deaths 15,224; in 1874, mem. croup 199, diphtheria 179, total deaths 16,238; in 1875, mem. croup 428, diphtheria 656, total number deaths 17,805; and further statistics point to a very perceptible yearly increase in diphtheria.

In Brooklyn, with an average population of over 400,000, according to the examination of over 80,000 death certificates by Dr. Lewis S. Pilcher,[2] croup (membranous and diphtheritic croup are here combined) was found to be one of the chief mortality causes. For seven years, from 1870 to 1876 inclusive, the figures are as follows: In 1870, deaths from croup 230; in 1871, croup 277; in 1872, croup 367; in 1873, croup 381; in 1874, croup 391; in 1875, croup 588; in 1876, croup 535; being a total of 2,767 deaths from that source in the above-named period. A decided annual increase is here observed in the croup mortality, that disease

[1] Meigs and Pepper, Dis. Child., Art. Pseudo-mem. croup, p. 86, 6th ed., Phila., 1877.

[2] Croup and Tracheotomy in city of Brooklyn, Proc. Med. Soc., Co. Kings, April 17, 1877.

rising, as shown by Dr. Pilcher, from the 11th position in the mortality scale in 1870, to that of the 5th place attained by it in 1876.

These figures, condensed in the following tabular form, give the relative proportion of occurrence, etc., in the before-mentioned cities:

City.	Period.	Mortality from Mem. Croup and Diphtheria.	Total Mortality, less Still born,	Proportion.
Mobile	1875 to 1880 inclusive	34	4,753	1 in about every 139⅞ deaths
New Orleans	1870 to 1879* "	743	61,188	1 in about every 82⅓ deaths
Philadelphia	1870 to 1875 "	3,035	99,056	1 in about every 32⅝ deaths
Brooklyn	1870 to 1876 "	2,767	80,000	1 in nearly every 29 deaths

* The year 1876 not here included.

Whether climate exercises any direct influence in this marked difference in the prevalence of membranous croup and diphtheria between these towns, other than that known to exist in all pulmonary and bronchial affections, must be answered by a more elaborate examination of the subject than space and material will here permit; but, whilst recognizing climate as a factor, I am inclined to regard the sanitary conditions of equal if not more importance.

It is well known that the season of the year stands in close relationship to the existence of croup, especially the membranous variety, and hence statistics show, naturally, the greater number of operations in those months when the disease is most frequent. In the present collection of cases the rise in the number of operations was found to commence with the first Fall month, attain its height in December and January, and then gradually decline until June, July and August, when it was at the minimum; also the best average of success was during these last months, when the proportion was 1 cure in about every 3 operations. The southern and northern cases followed this ebb and flow respectively,

and in both the best average success was found in the Summer quarter of the year.

In the entire collection the principal mortality causes after operation were obtained in 313 instances, the chief of which are thus arranged according to frequency of occurrence—extension of pseudo-membrane, asthenia, capillary bronchitis, pneumonia, exhaustion, and asphyxia. The death causes in the two sections of country were as follows:

Cause.	Northern States.	Southern States.	Total.
Extension of membrane	88	15	103
Asthenia	33	14	57
Capillary bronchitis	45	1	46
Pneumonia	30	0	30
Exhaustion	17	1	18
Asphyxia	1	12	13

Thus it will be observed that pneumonitis did not produce a single death in the southern operations, whilst among the northern operations a fatal termination resulted in 30 cases from this complication; and capillary bronchitis caused 45 deaths among the northern, and only 1 in the southern tracheotomies. The large proportion of deaths from suffocation in the southern operations appears more evident, perhaps, than should be, on account of the meagerness of the statistics from the South; but it is measurably explained by the delay in operating, which is the practice of the large majority of the surgeons in this section.

The period for operation after the invasion of membranous and diphtheritic laryngitis is a *quæstio vexata*, and one of much importance.

In the present collection of cases the time of operating was obtained in 276 instances. These indicated the most successful period to be the first and second stages of the malady—when the paroxysms of dyspnœa became marked and lengthened—and these two stages combined gave also a

ratio of success much greater than that of the third or last stage, when tracheotomy was delayed until death seemed imminent. This ratio was proportionally marked in the operations in the two sections—the southern and northern cases declaring equally in favor of early surgical interference. But it must be mentioned that, by far, the majority of the operations were deferred until the last stage, or when suffocation was about to close the scene; and this was of particular notice among the southern operations, in which division of the trachea was eminently a dernier resort. Notwithstanding the numerous clinical and statistical reports which have appeared in favor of tracheotomy at *any age* of childhood in membranous and diphtheritic croup, the opinion generally prevails that below two years of age the operation is attended by such a degree of unsuccess that the procedure is scarcely justifiable; that the most favorable period is between the years of three and five; that the successful issues begin to decline rapidly after the seventh year; and that in early adolescence a fortunate result is very infrequent.

I have shown elsewhere, from the analysis of a number of tracheotomies, that, in the cases collected, the most successful period was found to be in the following order—namely, 7 to 8 years inclusive (1 cure in every $1\frac{5}{7}$ operations); 6 to 7 years (1 cure in every $2\frac{3}{5}$ cases); 3 to 5 years (1 recovery in every $3\frac{1}{8}$ operations); and from 2 to 3 years (1 cure in every 4 operations). From birth to 2 years inclusive, the proportion of recoveries was 1 to $4\frac{7}{10}$ cases, and from 6 months to 18 months inclusive, the ratio was 1 cure in $5\frac{1}{4}$ operations. Again from 8 to 9 years the proportion of success was fair, being 1 in $3\frac{1}{2}$ operations; and there were also several cases of recovery at 14, 19, 35 and 52 years of age. The additional number of tracheotomies recently collected verify most thoroughly the conclusions which were arrived at in the paper already referred to, and an examination of the

total collection shows that the northern and southern sections agree alike in these general conclusions. Hence, I am prepared to repeat what was then said—namely, "That age presents no contra-indications to opening the trachea in croup."

At the present day the operation for division of the windpipe is not narrowed down to any single method, and the modification of the several procedures, as advised by different operators, are of some variety. In this collection of operations the mode of operating was recorded in 385 cases, of which 361 were by simple division, 22 by excision—the operation of Brainard where an elliptical piece of the tracheal tube is excised, thus doing away with the canula—and 2 by the galvano-cautery. The common method of a simple vertical incision, etc., however, is, I believe, the one most generally adopted in this country, since the other procedures are employed, for the most part, by their special advocates. Whilst possessing no actual numerical data as to the locality for opening the windpipe, I think, after a close analysis of the cases collected, the tendency of operators is to incline to the high operation, and that laryngo-tracheotomy and tracheotomy above the thyroid gland are the ones most frequently resorted to. This is explained by the easier performance of both the high operation and laryngo-tracheotomy, since the anatomical points are more prominent, and they do not require so thorough an anatomical knowledge or so careful a dissection as either that behind or below the gland necessitates. In the southern cases the high division of the trachea with the use of the ordinary canula appears to have been employed in the majority of the operations, and in all other details these cases seem to have differed in no wise from the course followed in the entire number of operations.

From some personal observation, and from considerable

study and investigation of the subject of tracheotomy in croup, I have been impressed with a few points which seem to me to be of especial importance in the performance of the operation, and very conducive to its favorable termination.

Of these the following are the most prominent:

First. That procedure is the best which dispenses with the canula, or any mechanical appliance whatever placed within the trachea, and hence the excision method, or separating the wound by wires or threads passed through the lips of the divided trachea, is to be preferred, and appears to be based upon the soundest surgical principles.

Second. Tracheotomy *proper* is to be selected in all exudative inflammations of the windpipe.

Third. The low operation is preferable on account of the greater diameter of the trachea at its middle in children, the upper portion of that tube near and at its juncture with the larynx being more contracted in early life; and again, the further down the opening the more apt it is to be lower than the obstructive exudate.

Fourth. The recumbent position of the patient with the neck raised and somewhat extended, offers the easiest posture for operating.

Fifth. An anæsthetic is most desirable, and preference should be given to chloroform on account of its less irritating properties.

Being an advocate of an *early* operation in croup, and the condition of the patient in the first stages being favorable for the use of an anæsthetic, this is readily administered, and but a small quantity is required to produce unconsciousness, which state should be just reached; for if reflex action is wholly abolished, the surgeon loses the valuable aid of cough in notifying him of blood passing into the trachea, and in expelling it therefrom. In a word, an obtunding of the cutaneous sensibility is all that is required.

Sixth. The skin wound should be of sufficient length to permit of easy recognition of the underlying tissues, and for a proper dissection in reaching the windpipe.

Seventh. As much rapidity as is consistent with care and safety should be used in executing the operation.

Eighth. Make the operation as near bloodless as can be effected; therefore, lay aside the bistoury after the first incision, and, by means of the knife handle or director, scratch or tear a road to the trachea, staunching all oozing before incising the tracheal tube.

Ninth. The opening in the windpipe should be covered with a thin gauze, and a moist atmosphere with a moderately warm temperature maintained in the apartment.

Tenth. Most careful nursing by an experienced attendant, and frequent cleansing of the edges of the wound, or inside canula.

Eleventh. When the acute symptoms have subsided, make frequent tests of the laryngeal respiration, and remove the canula as soon as breathing can be carried on by the larynx. Hence, the rule should be, remove the canula at the earliest moment.

Twelfth. The canula should be always double; the tube revolving in the neck shield; of a short curve; beveled edges; medium length; and a diameter sufficiently large to fill but not distend the trachea.

Thirteenth. Advanced asphyxia, even where death has apparently taken place, should not deter the surgeon from operating.

Fourteenth. Marked attacks of dyspnœa, which are found to be unconnected with obstruction of the canula, require an early and thorough search for casts or membranous plugs below the opening.

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