TEACHER'S NODES
OF THE VOCAL CORDS.
A THESIS

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BY

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ON

"TEACHER'S NODES OF THE VOCAL CORDS, AND ALLIED MORBID CONDITIONS DUE TO EXCESSIVE USE OF THE VOICE."
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ON TEACHER'S NODES OF THE
VOCAL CORDS, AND ALLIED MOR-
BID CONDITIONS DUE TO EX-
CESSIVE USE OF THE VOICE

SYNONYMS. Singer's Nodes, Chorditis Tuberosa.
Sängerknoten, - Entzündungsknoten.

CHAPTER I.
DEFINITION

Chorditis Tuberosa, or Singer's or Teacher's Node is a peculiar pale small poppy-seed-like growth, frequently surrounded by a zone of hyperaemia, which appears on the upper surface and free border of one or both vocal cords about the junction of the anterior third with the posterior two-thirds, the ultimate cause of which can, in the vast majority of cases, be traced to persistent over-use of the voice.

TERMINOLOGY

The terminology of Chorditis Tuberosa is unsatisfactory, for no name at present in use is equally applicable to all cases of the disease; thus "Singer's Node" is not comprehensive because many of the subjects
follow other occupations; "teacher's node" is open to a similar objection; the term Chorditis tuberosa is misleading, for there is occasionally no chorditis. Again the affection has been described as Trachoma of the vocal cords, but this term, which is indebted to Turck for its origin, was applied by that author to cases presenting multiple granulations on the edge and upper surface of the cords. On the other hand the disease in question is characterized by a single growth on one or both cords. I have also seen the expression "nodular laryngitis" (laryngite nodulaire) used by Moure, but as there is sometimes no laryngitis to be detected the term must be considered imperfect. Stoerk is responsible for the term "Singer's Node" or "Singer's Nodule", his experience of the disease having been obtained amongst singers, and the German equivalent (Sänger-Knoten) is the name found in the works of most Teutonic Laryngologists who have referred to the affection. Gottstein and Snitzler (according to Haring) both consider the name entzündungsknoten ("inflammation nodes") an appropriate one. Some observers believe that mechanical irritation rather than inflammation causes the node, so that this term would not satisfy them; but if the inflammatory origin of nodes be correct it appears that no better name then "inflammation nodes" has been at present suggested.

In the following pages, I shall for convenience
of description, employ the term "node" or "Chorditis Tuberosa" when speaking of the condition in the abstract without special reference to singers, teachers or others, and I shall use the expression "Teacher's Node" or "Singer's Node" respectively, when referring to the disease as observed especially in Teachers or Singers.

The Nature of Chorditis Tuberosa is also a subject of some difficulty. It has, as already pointed out, been classed by some writers, Knight 
141, Mackenzie, 
142 and others, as a variety of trachoma and although the pathological structure of the two conditions may be identical (as indicated by Wedl 
1261) they are clinically I believe different diseases.

<table>
<thead>
<tr>
<th>Chorditis Tuberosa</th>
<th>Trachoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Almost invariably occurs among excessive voice users</td>
<td>1. Sometimes seen in excessive voice users but frequently in tubercular and other subjects.</td>
</tr>
<tr>
<td>2. Almost invariably occurs in same position - at junction of anterior third with posterior two thirds.</td>
<td>2. May occur anywhere on the cord.</td>
</tr>
<tr>
<td>3. Never more than a single node on each cord</td>
<td>3. Are usually multiple.</td>
</tr>
<tr>
<td>4. Node is situated on edge and upper surface of cord.</td>
<td>4. Often entirely on upper surface of cord</td>
</tr>
<tr>
<td>5. Characteristic appearance is a pale poppy-seed-like growth with zone of congestion, and vessel running into swelling.</td>
<td>5. As observed by myself, characteristic appearance has been red and granular elevations diffused irregularly over one or both cords.</td>
</tr>
</tbody>
</table>

A consideration of the above table leads me to the conclusion that Chorditis Tuberosa is clinically
a distinct affection from that of the diffuse and multiple nodes extending over the cords which is more correctly comprehended in the term Trachoma employed by Turck.

Chorditis Tuberosa is frequently described as a clinical variety of Pachydermia. Mc.Bride points out that the researches of Kanthack (v. Pathology p16) have shown that the epithelium of the Nodes is more or less altered; Chiari (v. Pathology p17) also examined two specimens and found that they were for the most part composed of epithelium which in one instance sent processes inwards and thus produced a papillary structure. Virchow's classical account of the morbid histology of pachydermia on the other hand, enumerates great thickening of epithelium, horny changes in the outer cells and multiplication of papillae, therefore Mc.Bride is of opinion that there is no sound reason for making any distinction between two conditions which are pathologically more or less identical. This observer recognizes, however, differences existing between Chorditis Tuberosa and pachydermia as clinical entities, and the Differential Diagnosis of the two conditions will be alluded to in that section of the paper (p. 34).

Rice says that in the later appearances of the pachydermic larynx, as described by Virchow, the observer does not recognise any similarity to Chorditis Tuberosa, which disease is in his experience, rare in
aged drinkers, the usual victims of pachydermia but occurring in young adults and in singers of temperate habits. Further, the thickening extending from the vocal bands both above and below forming polypoid enlargements, as Virchow delineates the later lesions, Rice has never observed in Chorditis Tuberosa.

It appears to me that, as Mc.Bride suggests, the pathological association of the two conditions is so close that it is impossible to disconnect them, and the assumption that Chorditis Tuberosa is a clinical variety of pachydermia can only be regarded as correct.

HISTORICAL SKETCH.

The relative importance of Chorditis Tuberosa would not appear, from the paucity of its literature, to be very great, and it is hardly to be expected that a disease affecting (or supposed to affect) an exceedingly limited number of the community - a morbid condition, moreover, presenting no very grave possibilities - would attract a large amount of attention: most authors have been content with a brief account of the condition, referring to it as one of the manifestations of chronic catarrhal laryngitis.

Turck in 1866 first described and figured a peculiar form of inflammation limited to the vocal cords which he often observed in professional singers and to which he gave the name "Chorditis Tuberosa".
although he sometimes applied the name "Trachoma" to the same condition. The principal references to the disease, since the date mentioned above, will be referred to in order.

In 1876 Von Ziemann alluded to "Chorditis Tuberosa or Trachoma" as being due to a "partial dermoid metamorphosis". Morell Mackenzie in the edition of his text-book on "Diseases of the Throat and Nose" published in 1880 refers to "Chorditis Tuberosa or Trachoma" of the vocal cords as an affection most frequently met with in singers. Knight next described a case of "Singer's Node or Trachoma". In 1883, Turck and Wagner made some observations on the pathology of the tissues involved in the disease, in the year 1886, and in 1888 Stoerk made further observations in the same direction. Fraenkel referred to the pathological conditions found in Chorditis Tuberosa, and Rice in the following year published a paper on "Singer's Nodes". In the year 1893 Gottstein and Lennox Browne described the disease in question in their respective text-books. In 1894 Knight published a paper on "Singer's Nodes" in the New York Medical Journal. The remaining papers on the subject are those of Milligan and Hodgkinson, read at the Meeting of the British Medical Association in 1895, and of Haring published in the Manchester Medical Chronicle during the same year. References, more or less extended, are made to the sub-
ject in the works of Schützler, Watson Williams, Mc.Bride and Bosworth; editions of all these works have been published within the last two years.

The foregoing remarks indicate that the literature of the subject is not extensive; the affection is usually referred to as "Singer's Node" or "Singer's Nodule" and many of the references are brief, sometimes hardly more than indications that the existence of the condition is recognized. The wedding of the attributive "Singer's" with the term "Node" appears to me to suggest an explanation of the comparatively small amount of attention which has been bestowed upon the disease, for it implies that singers are, as it were, the monopolisers of the morbid condition in question. But professional singers - they presumably being meant - are but a section of the victims of Chorditis Tuberosa. I imagine that a large number of such patients are outside the ranks of professional users of the singing voice and includes all whom necessity or choice leads to employ the vocal organ excessively or under unfavorable conditions. The body thus denoted would embrace clergymen, and other public speakers, hawkers, costermongers, and street vendors generally, and lastly school-teachers, especially those engaged in the instruction of the lower classes. It is an Laryngeal Node as noticed in this last division of voice-users that I have founded the majority of my personal observations, and I shall attempt to show that if the statistics
which I have gathered together are reliable, the condition is exceedingly common (about 20 per cent of all female elementary school teachers) in a community to whom impairment of this organ means considerable discomfort and possibly loss of occupation.

If it be proved therefore, that Chorditis Tuberosa exists not only in professional singers, but also commonly in excessive voice-users generally, it appears to me right to accept the corollary that the disease possesses an importance which has not hitherto been attributed to it.

Although the authors whose attention has been directed to the subject have in many cases recorded valuable observations, there are still a large number of points which require to be elucidated, especially with regard to the pathology of the affection, its etiology and its prophylaxis. Our present want of certainty as to the pathology of Chorditis Tuberosa is principally referable to the difficulty of obtaining microscopic sections of this morbid formation, for the disease is never fatal, and to obtain a specimen from the larynx during life is frequently not feasible. Again, the etiology and prophylactic indications, which go to a certain extent hand-in-hand, are greatly obscured by the want of opportunity of observing the node in its earlier stages, and of examining the vocal cords (in cases which ultimately develop nodes) before the stage of actual node-formation is reached.
I believed that by observing the larynx in teachers who had been pursuing their occupation for some time — but who had not applied for treatment on account of vocal defects — and by noticing their surroundings and the influences they were subjected to during vocalisation, that some light might be thrown on certain points connected with the disease, which are still sub-judice. With this object I examined one hundred female school-teachers, selected hap-hazard from those who had been following their occupation in various schools (Board and Voluntary) in the City of Manchester.

The conclusions drawn from this examination I have embodied in the discussion of the subject following these remarks.

NOTE: ROMAN FIGURES refer to Table of NODES.

ENGLISH " " " TEACHERS.
CHAPTER II.

SYMPTOMS.

The principal symptom of Chorditis Tuberosa is impairment of the voice in the form of hoarseness; this is especially noticeable in the singing voice, all or at least the upper notes, of which may be lost. On the other hand nodes may exist without any vocal disability (v. cases V – VI) and, conversely, the condition of hoarseness in a patient habituated to using the voice excessively does not by any means point to their presence.

The amount of impairment of the voice depends according to Rice on three factors, viz., the size of the nodule, the degree of inflammatory change in the band, and the dexterity with which the voice is used; for, he points out, many singers vocalise well with greatly altered cords, owing to the skill with which the organs are exercised. The voice therefore may be little affected even in Singers.

Diplophonia has been noticed by Snitzler and Moure and the latter observer states that, in children, the voice may be hoarse, gruff, or aphonic, and that there is a peculiar sudden stoppage of the voice. For the amount of hoarseness observed in teachers together with other points connected with nodes occurring in such individuals see table of Nodes p. 53.
tones when the child commences to cry.

It seems to me that the intensity of the vocal impairment depends largely upon the concomitant laryngeal catarrh. In several cases which have come under treatment the hoarseness has dissappeared pari passu with the laryngitis.

A feeling of undue fatigue in speaking and of an aching sensation referred to the region of the larynx is usually present; it has received the name of "Laryngeal strain", and the probable cause of its appearance is a paresis of the tensors of the cords due to overstrain of those muscles. It is perhaps more correct to call it an accompaniment of nodes rather than a symptom. It has been suggested that laryngeal strain is due to the extra muscular exertion involved in the endeavour to approximate the cords truly in spite of the presence of the Nodes. Actual pain is not present unless there is marked laryngitis.

On laryngoscopic examination there is observed a peculiar small pale poppy-seed-like growth on the upper surface and free border of (usually) both cords. The "seat of election" of these tiny protuberances is at the junction of the anterior third with the posterior two-thirds of the cord; frequently a small zone of hyperaemia is seen surrounding the Nodes, and there may be some laryngeal catarrh. Milligan and Haring describe a small vessel running from the surface of the cord to the base of the Node, although the latter
Illustration I. Case IV
observer states that he has seen such a vessel only in large nodes. I have not, myself, been able to make out the presence of this vessel.

Regarding the position of the nodes, laryngologists mostly concur, (1), as to their situation relatively to the cord, and (2) as to their position relatively to each other. The usual site is agreed to be at the junction of the anterior third with the posterior two thirds of the cord, but I have seen two or three cases of nodes, referable to vocal over-strain, in which these protuberances were situated posteriorly to the ordinary situation (v. Case IV). The relative position of one Node to the other is usually described and figured (Bosworth, Snitzler, Haring and others) as exactly opposite. Watson Williams states that a Node on one cord may be at first confronted by a depression which depression is raised, and afterwards becomes a true Node like its partner.

I cannot concur with the view that the nodes are invariably opposite (Haring). In 7 out of 16 cases of Nodes examined, the swellings were not opposite and in each of the cases in which this was observed, the left Node was in advance of the right; it was especially noticeable on phonation. Nevertheless, the statement that the nodes are exactly opposite probably holds good with the majority of cases. The patient from whose larynx the drawing (Illus. II) was taken, was
Illustration II. Case 8
Showing Nodes not exactly opposite.
- as stated by some authors.
always opposite.

Illustration IV. Case 7x
Showing single node.
an example showing these swellings not situated opposite to each other.

Nodes are said to be, in the great majority of cases, double, that is, there is a node on both cords; out of 16 cases of nodes I have encountered one only in which the swelling was solitary (case IX) III

Schützler "II" states that the node may be abraded or eroded. I do not find this assertion reduplicated in any other author's works, nor have I observed it myself.

The size of the swelling has also been the subject of some divergence of opinion; thus Lennox Browne, who observed Chorditis Tuberosa mostly, I believe, amongst singers, remarks that the dimensions vary from the size of a millet seed to that of a small pea, Mc.Bride also figures two "Singer's Nodules" each about the size of a split pea. On the other hand, Milligan believes that in teachers, at any rate, the node varies from the size of a pin-point to that of a millet-seed, and with this statement my own observations lead me to agree, although the agreement may result from the observation of the same class of cases - teachers - .

The relation in size of one Node to the other is generally one of equality. I have seen a few cases in which a particular node was smaller than its fellow

Of the association of nodes with other diseases there is little to be said. Haring states that
more than half of the patients he encountered were anaemic, also that there was, in the great majority of instances, catarrh of the vocal cords more or less well marked. There was no traceable connection with tuberculosis, syphilis or any acute fever. Milligan has noted the frequent concurrence of nasal, especially post-nasal catarrh, and cannot dissociate the post hoc proper hoc of the conditions. Rice observed in one case the disease Chorditis Inferior Hypertrophica.

My own observations lead me to conclude that anaemia is sometimes present, though of how frequently I have unfortunately no record. Laryngeal catarrh, usually only slightly marked was present in the majority of my cases, in six patients (out of sixteen) I also noted granular pharyngitis.

Small nodes frequently give rise to no symptom per se sufficiently exigent to direct the patient's attention to the throat. In the seven nine cases which I encountered while visiting the schools referred to above (p. q) the symptoms occasioned by the Nodes—which were in each case comparatively early—had rarely been marked enough to cause the patients a suspicion that any abnormality existed in their laryngeal organs.
CHAPTER III.

PATHOLOGY.

It was remarked above, en passant, that the total number of microscopic sections of Chorditis Tuberosa is small, and this is not surprising when the obvious difficulty of obtaining specimens is noted. The disease is rarely met with in the post-mortem room and the frequent impracticability or inadvisability of removing the nodules during life, still further handicaps the pathologist in his search for material. It is true, however, that several individuals have obtained specimens which have been submitted to microscopic examination. These observers include Chiara, Kanthack, Rice, Sabrazes and Freche, Schrötter, Türk and Wagner and Wedl.

I myself have also been fortunate enough to secure a Node for investigation under the microscope and the result is described and figured on page 119.

The actual nature of a Node is by some regarded purely as the products of an underlying inflammatory process and hence are called "inflammation nodes." Others look upon their occurrence as the direct result of mechanical irritation due to the effects of prolonged muscular strain.
There is as yet no definite dogma with regard to the exact constitution of a Node which is accepted as orthodox by pathologists and it would seem advisable, therefore, to briefly review the theories, based on microscopic or clinical observations, which have been formulated by the various writers who have animadverted to the subject. These theories will be alluded to partly in the present section and partly in the section dealing with Causation.

Kanthack (cited by Gottstein) from the examination of three specimens was led to believe that the Nodes he examined were the result of chronic inflammation. In one case there was hyperplasia both of the epithelium and of the elastic fibres. In the second case the epithelium was almost totally cornified, the surface of this structure was not even but papillomatous projections were visible, reminding the observer of the filiform papillae of the tongue; the remainder, (that is, the bulk) of the node consisted of fibrous tissue in whose meshwork many round cells were found. The third case presented hypertrophy of the epithelium and papillae; the fibrous tissue of the node was myomatous.

Further, in a recent communication Kanthack states that there is, in all cases of Singer's Nodes and in chronic pachydermia, "an interstitial myositis", especially in the region of the processus vocalis. This observation appears to me to point towards an
inflammatory origin of the node - inasmuch as there is
evidence of a more or less generalised chronic inflam-
matory process in the muscle - rather than to its in-
ception from purely mechanical and local causes.

Chiari (cited by Gottstein) arrived at conclu-
sions similar to Kanthack's but in one case he found
cystic glands in the Node examined.

Fraenkel believes that the nodes are of glan-
dular origin. Kanthack examined twenty larynxes but
found no trace of glands towards the free edge of the
cord - the site, par excellence, of the small nodular
swellings under discussion. Coyne corroborated Kan-
thack's conclusions.

Türck and Wagnier remark that a node consists
of a localized thickening due to small confluent tu-
mours caused by hypertrophy of the chorion and epithe-
lium. These observers regard the condition as allied
to Chorditis or Trachoma of the vocal cords.

Sabrazes and Freche (cited by Knight) examined
three specimens and the result practically coincided
in each. There were circumscribed hypertrophies of
the epithelium and chorion of the mucous membrane and
sometimes the thickening of the epithelium predominated
rather the papillary prolongations of the chorion, but
mostly, remark the authors, both were found to parti-
cipate.

Wedl (cited by Knight) examined a node taken
post-mortem from the trachomatous cord of a patient of Türck's, who had died of tuberculosis, and found the same structure as in a simple Node, that is, a pathological arrangement similar to that indicated in the preceding paragraph.

Rice examined two specimens removed by means of his "snap-shot guillotine" (v.p.n.) The result, which was the same in both cases, was the observation of connective tissue and epithelial elements in large-ly increased numbers.

Morell Mackenzie says a "Singer's Nodule consists of hypertrophied connective tissue and proliferated nuclei.

Schrötter (cited by Haring) believes that the Node consists of epithelial thickening or the remains of a cyst.

Stoerk found that the nodules were most frequently composed of connective tissue, of elastic fibres, and proliferated epithelial cells.

Milligan believes, from clinical observation, that the node is the outcome of a localized inflammatory process - a chorditis. On account of frequent mechanical irritation and muscular overstrain, congestions, haemorrhages and serous transudations occur, with the result that a hypertrophy of the epithelium and submucous connective tissue takes place. In some cases although the same causes acting on both cords through the same period of time and in the same manner
Illustration V

Longitudinal section of Node (Case IV) Stained with Hematin (×50)

A. Thickened Epithelium (Node)
B. Normal Epithelium of Vessel Cord
C. Subepithelial tissue, showing few leukocytes
D. A papillary projection from Node.
should theoretically affect both equally, they do not always do so, and the nodular swellings are unequal in size pointing to unequal developments. In some cases, Milligan believes, the second node is produced by the mechanical irritation induced by the friction of the first node against the opposite cord.

My own specimen was a small node which I discovered in the larynx of a young woman who had strained her vocal organs both by singing and by being in the habit of talking for an extended period of time in a room where there was a loud noise of machinery. There had originally been a much smaller node on the left cord but this dissappeared under the influence of astringent sprays.

After cocainising the larynx I introduced Schrötter's tube forceps and snipped off the Node together with a minute portion of the mucous membrane of the cord.

The microscopic section obtained is figured on (pp 1910) The main change observed is a marked localised thickening of the normal epithelium - an actual increase in the number of epithelial cells not a mere proliferation of nuclei. The thickening affects each layer of the epithelium, for, in the region of the Node, not only is the outer portion thicker, but also the layer of more deeply stained cells beneath it is increased. There are a few papilla-like outgrowths off the surface of the Node. I cannot make out any
Illustration VI

Longitudinal Section through Node
Stained with Hematin (X 300)

Showing focal thickening of epithelial cells
with some compaction of a few of
the outermost cells.

A few leucocytes in subepithelial tissue.
marked increase of cells or other change in the submucous tissue underlying the Node.
CHAPTER IV.

CAUSATION.

Numerous hypotheses, more or less ingenious and probable, have been advanced to account for the existence of the Node and for its evident predilection for one particular situation on the vocal cords, but it appears that no one theory satisfactorily points to the mode of origin of the nodular enlargements nor has any observer deduced a valid conclusion as to the reason why the tumour, in the large majority of instances, has a "seat of election".

PREDISPOSING OR REMOTE CAUSES.

There is a striking unanimity in ascribing to overstrain of the larynx the principal rôle in predisposing to the formation of Nodes. Gottstein, however, is a dissentient from this theory for he is doubtful whether excessive vocal exertion is responsible for the condition. He says he has frequently seen Chorditis Tuberosa in children whose mothers have assured him that the little patient's voices had never been strained by crying or in any other way.

Rice on the other hand, remarks that the conclusion he arrived at from the histories of eight
cases of the disease, which he had encountered, was that there was always an account of vocal overstraining; he adds that he had never seen a Node in an individual who used his voice merely in ordinary conversation. I have met with one such case.

(Case V) Lucy H.- aetat 23, mantle maker. About two years ago she began to suffer from hoarseness, and, a few months after that, from an aching pain referred to the region of the larynx. She has two small Nodes in the usual position with slight laryngeal catarrh. She assures me that she has never strained her voice in any manner whatever; has never done any singing or school teaching, and is never obliged to shout, to make herself heard, at her work, since it is carried on in a quiet room. Is not an excessive talker.

It is evident from Gottstein's remarks and from the above case (presuming the information correct) that vocal overstraining is not always a cause of the disease in question; in the large majority of cases, however, this etiological factor will, I believe, have been present.

Moure is of opinion, further, that in children the straining of their voices in choir-singing is not infrequently followed by Nodes, and this he has observed most commonly in alto-voices. Again, speaking of Nodes in general without reference to the age of the patient, he believes that these lesions make their appearance by preference in laryngeal organs possessing
a deep register rather than in soprano or tenor voices.

The antithesis of this view is advanced by Bosworth and by Watson Williams to whom reference will be made later.

Milligan (60) believes that (in female school teachers) other predisposing causes are in operation. Thus, the age (13-16 years) at which these individuals are first called upon to fulfill their duties, is a period at which the first great strain is being put upon the female economy. The organism is not able to cope with the dual demand made upon it and the over-taxed vocal cords readily become hyperaemic. This hyperaemia is followed by other changes (which I shall speak of in dealing with the Exciting Causes) which ultimately lead to the formation of Nodes. It is possible that, as this observer suggests, nasal and especially post-nasal catarrh may be a factor with the etiology of the condition; he does not attempt to explain the connection, but points out the frequent concurrence of the two conditions. In addition to the above mentioned circumstances, the circumstance of the presence of anaemia, foul air, long hours, mental strain and other deteriorating influences, complete the total of the adverse conditions tending remotely to Teacher's Nodes.

The age of sufferers from Chorditis Tuberosa appears to be young adult life. The disease does not
seem, as far as my experience goes, to be common in children, and I have never seen or heard of a case in an old person, male or female.

Sex is an influential predisposing cause as far as I have observed the condition in teachers. I have examined about 25 male teachers on different occasions and in only one (case 1) was there discovered a node. But in female teachers they are, I believe, comparatively common; the latter sex also suffers far more from vocal disabilities in general than does the male sex. I make this assertion on account of the large number of female school teachers who present themselves at the Throat Department of the Manchester Consumption and Throat Hospital.

**EXCITING OR IMMEDIATE CAUSES.**

As might have been gathered from the account of the Pathology of Chorditis Tuberosa, observers are divided into two sections, one of which accepts almost as an axiom, the statement that the node is caused principally by mechanical irritation, whilst the other adheres to the theory of the inflammatory origin of the swelling.

Snitzler (cited by Haring) looks upon the Snitzler Nodes as the direct result of inflammation. Gottstein" Gottstein would bestow upon the swellings the term "inflammation
Evidently actuated by the same belief, Milligan's account of the probable cause of Node-formation is that there is a precedent condition of chronic catarrhal laryngitis, then "slow and insidious changes due to a hyperaemic condition of the blood-vessels of the true cords, are set up, ending in a gradual hyperplasia of the submucous connective tissues, and followed by paresis of certain laryngeal muscles. These changes may progress somewhat rapidly and at an early stage minute Nodes may appear." The various lesions, according to this author, which lead up to the condition of secondary pachydermic changes local or generalised are chronic catarrhal laryngitis, with or without, a varicose condition of the smaller vessels of the true cords, accompanied or not, by paresis of certain laryngeal muscles; these various stages may pass almost insensibly from the one to the other, "so that when the stage of actual node-formation is reached we must recollect that it is in reality the outcome of a gradually progressive series of pathological changes." 

Rice believes that, as a rule, the catarrhal inflammation is primary and the Node secondary, although he thinks the opposite order of occurrence is sometimes followed.

Kanthack believes the Node to be the result of chronic inflammation.

Up to this point observers have been mentioned who lean towards the inflammatory origin of the con-
Illustration VII. Vocal cords (during phonation.)

If a trained singer, indigo, finely powdered, has been blown upon the bands and is now being receding outwards, move quickly in the centre of the cords because of the greater amplitude of the vibrations there.
dition, that is, they believe that the node follows the inflammation, not the inflammation the node.

Klebs (cited by Haring) suggests that the vocal cord vibrates in segments and that there is a "nodal point" at which Nodes ultimately appear. Hodgkinson's researches on the vibrations of the cords render this view improbable. For a "nodal point" being understood to mean a spot on a vibrating cord or membrane where the vibrations are absent or at a minimum, Hodgkinson showed that there were no nodal lines or points running at right angles to the cord - the existence of which would be necessary to accept Klebs' view - whatever register was used; in the falsetto voice only was there a nodal point and that was parallel with the free edge of the cord.

I have verified these results myself (v. Haring). Haring thinks the cause of the appearance is "mechanical irritation" In support of this view he cites two cases. In the first instance there existed a fibroma on one cord and a Node on the other at the point of contact. In the second case there was a papilloma on the left cord and a small Node at the point of contact of the neoplasm with the right cord. I have myself also noted the combination of a fibro-papilloma on one cord with a Node at the point of contact (on phonation) of the cord (case 2.) but I am inclined to think that these facts are not of much weight in support of the theory, for a fibroma or a
fibro-papilloma is a body which would exercise a far greater influence in the way of friction on a cord than the mere attrition, supposing that possible, of the cords together at one point. I have seen a case (case IV) in which a large node on the edge and upper surface of one cord remained in position for at least two years, the length of time the patient was under observation, and no change was ever noted on the cord opposite to that on which the Node had formed. This appears to supply a negative argument against Haring's theory.

Haring also points out in support of this view of mechanical irritation the constant position of the Node and the occurrence of the affection in people who subject their larynxes to strain. The same observer next discusses the question why the Node appears so constantly in the same position and advances the view that the cords probably bulge at a point just anterior to the middle of their length and, touching at that point, by constant attrition produce the Nodes. The bulging Haring accounts for on the assumption that the straining of voice which occurs in teachers or singers produces a paresis of the crico-thyroid muscle, the most important tensor, and thus the first to be most likely affected by fatigue reminds me that Morell Mackenzie points out the wavy line of apposition of the cords in paralysis of the crico-thyroid muscle and believes that there is an allied condition
due to paresis of the same muscle, which paresis causes the cords to bulge as indicated above. Moreover, Haring has observed in many cases of excessive vocal use that the convexity or bulging takes place in such a manner that the cords touch at a point anterior to their middle before apposition is complete. The violent contact of the bulged portions if long enough kept up, will cause a thickening, just as in any other part of the body intermittent mechanical irritation leads to hypertrophy.

To Haring's theory there appear to me to be several objections. Crico-thyroid paresis, as I have observed it, does not appear to be indicated by a bulging in one particular place but to vary somewhat and to be more noticeable in the region of the vocal processes than elsewhere. I have never noticed a bulging anywhere near the seat of Nodes. Again Haring's theory denotes that attrition, and that alone, causes the Node, but the researches of Kanthack and others show that there is usually a chronic inflammatory process and not a mere cornification such as, it leads one to conclude, would be the case if Haring were correct in his surmises. Also the later observations by Kanthack that in Chorditis Tuberosa there is an interstitial myositis points to an explanation other than that of mere attrition. I concur with Haring, however, in believing that attrition, produced in some way, plays a
part in the production of Nodes, from the fact that the pathological structure of some of the specimens examined (especially case I of Kanthack's *Thesis*) show evidences of mechanical irritation particularly on the surface.

Knight states his belief that the immediate cause of Nodes is that friction is greatest at the site on which Nodes eventually appear and hence the changes occur which lead to their production.

Watson Williams and Bosworth share a view regarding Chorditis Tuberosa which to me appears open to the objection that it is logically inadmissible on account of its applying to a limited section only of sufferers from the disease, for the hypothesis offers an explanation of such cases merely as occur in singers.

Bosworth says that it occurs in his experience, as the result of an attempt to use the highest powers of the larynx when that organ is in a state of chronic catarrhal inflammation; to exert an effort which can be accomplished with impunity only when the larynx is in a state of perfect health. The point he specially desires to emphasise is this, that in the production of the upper notes of the head register, requiring, be it noted, the highest powers of the organ of voice, the one cord is held in apposition with its fellow for the posterior two-thirds of its length, a chink being left
in the anterior third. Now it is at the posterior end of this chink that Nodes make their appearance, and Bosworth is disposed to conclude that they are the result of this excessive effort in holding the posterior portions of the cords in apposition during the production of very high notes when the larynx is in a state of inflammation.

Watson Williams differs only in detail from the foregoing observer, for he believes the condition is almost monopolised by sopranos; and he also states, definitely, that he is of opinion that the node is the result of attrition of the portions of cord bounding the chink, alluded to above, posteriorly.

It is thus seen that Bosworth favors the inflammation theory and Watson Williams that of mechanical irritation, but they concur in attributing the condition to the forcing of the highest powers of the larynx when in a state of catarrhal inflammation.

The great objection to the theory, on the other hand, is that if it be an explanatory it is one of certain cases only of Chorditis Tuberosa; for I have very frequently seen the disease in teachers and others, who rarely if ever sang or who certainly had never used their singing voices to any extent. But since the disease, as it appears in persons not professional singers, seems to be identical and synonymous with the affection as it is observed in the individuals to whom Bosworth and Watson Williams refer, it
Illustration VIII

Larynx of a noted music-hall singer, showing small fibro-cellular growth at each side of Rhonchus Tuberosa, but confined to one cord. There was a minute nodule (at point of contact) on the cord (left figure). T.C. had for years been singing ten songs amounting convinctions of other forms of Vocal Exertion.
is probable that there is a common cause which would apply equally to singers, teachers, costermongers, or indeed to any persons who suffer from the disease.

Mendel says that chronic hyperaemia due to local irritation precedes the formation not only of Nodes but also of laryngeal polypi and, according to the duration and intensity of the inflammatory reaction, a Singer's Node or a polypus is formed. He has induced both a Singer's Node and what appeared to be a true polypus to disappear under appropriate antiphlogistic remedies, and upon a consideration of these facts he principally bases his views. (c.f. 96. VIII p.31)

Hodgkinson brings forward a theory which at first sight appears eminently probable. He says that in cases of Nodes there is generally a history of several attacks of precedent laryngeal catarrh, a statement with which I concur (See Table of Nodes p6.3)

Further, he continues, during these attacks the cords swell, and, in the region of the anterior commissure this swelling has certain notable effects, for it causes a jamming and immobility of the portions of the cord in the immediate vicinity. The more the cords swell the more of their anterior parts will become jammed. Then follows the result of this condition. Anteriorly, the swollen and jammed portion does not vibrate, at a point immediately behind this portion the cords vibrate but touch, and still further back the cords vibrate but do not touch, attrition occurs and
Illustration IX (Case No. 66)

"Prenodal Swelling" (Hodgkin's)
so produces the Node.

My own observations lead me to be extremely doubtful of this theory, and for the following reasons. In the examination of the teachers, the results of which are tabulated at the end of this Thesis (p.p. 55-69) I encountered several cases of early Nodes. I also met with two or three cases of "praenodal swelling" (as Hodgkinson terms the condition he refers to) but not (except in one case No. 66) in connection with early nodes, where one would have expected to find traces of the condition, but in occasional instances of chronic catarrhal laryngitis (e.g. case 40) But the conviction is borne in upon me that if the theory under discussion were correct I should have frequently seen "Praenodal swelling" and in every stage, from a mere indication up to the involvement of all the anterior thirds of the cords. Further, it would have been observed wherever Nodes were present and in many instances where Nodes were absent. But this was not the case, its observation was a rare occurrence, and in no instance did the praenodal swelling occupy more than 1/3 of the anterior portion of the true cords (Illus. 65) Conversely, I have seen the case of a teacher who developed Chorditis Tuberosa whilst under observation but exhibited no trace of praenodal swelling before the Nodes appeared, although there was a very slight indication of such when the Nodes were discovered. (Case 66)
Another point against Hodgkinson's theory is that it hardly offers a sufficient explanation for the presence of Nodes in positions other than the junctions of the anterior third with the posterior two thirds of the cord. (e.g. Case IV).

Lastly, the observer's theory assumes, as far as I understand it, that the Node is due directly to attrition and that alone, which from a consideration of the Pathology and other points appears to be doubtful.

Hodgkinson also remarks that a "froth spot" - a small spot of foam produced by the churning up of the mucous where the Nodes are about to form - is a sign of some value as indicating the probable inception of the Node in the situation in which the "froth-spot" is seen. I have noticed this appearance on one or two occasions.

The foregoing theories are all that I have encountered bearing on the causation of the disease.

It perhaps appears surprising that a hypothesis of mechanical tension or strain (apart from mechanical irritation) on the principle of the cord being an overstrained string or rope has never been formulated, but experts in physics, who have been questioned on the subject, declare that in dealing with a human organisation such as the larynx any comparison with a wire, rope, or string would be purely chimerical.
CHAPTER V.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

The disease is not one difficult to diagnose nor is there much liability as far as I am aware, to confuse it with other morbid conditions.

Mc.Bride says that a Singer's Nodule if unilateral may be distinguished by its white colour. He remarks also that it differs from true pachydermia found in the same position by the small size of the Nodules, their pale colour, and their smoother outline.

Rice believes the conditions might have to be differentiated from the cicatrix of an old tubercular or syphilitic ulcer on one or other cord.

I have seen such a case in a male teacher in which a small cicatrix on the right cord, about the usual position of a Node, was at first mistaken for one of these tumours.

Rice adds further that we must differentiate Chorditis Tuberosa from granulation tissue springing from ulcers of the description he mentions. Lastly, Rice would bid us not mistake benignant growths on the cords for Nodes.

Haring is of opinion that the Nodes may be overlooked owing to the coincident catarrh of the cords.
the swellings, may also, he thinks, be mistaken for laryngeal growths. In order to guard against this it should be noticed that the Nodes are usually bilateral, opposite, and invariable in position. I am not prepared to accept the assertion of immutability of position as I have, on one or two occasions, observed Nodes in other positions (Case IV) than the middle of the ligamentous portions - their characteristic site. Haring further points out that the Nodes are seen to be part and parcel of the substance of the cord.
CHAPTER VI.

PROGNOSIS.

Laryngologists, as a general rule, without taking a markedly optimistic view of the prognosis of Chorditis Tuberosa regard it as capable of considerable amelioration, believing that, while depending largely on the treatment adopted, the prospects of cure are moderately good.

Mc. Bride speaking of pachydermic processes affecting the anterior portions of the cords says that "improvement of vocal function will probably depend upon the success of such operative measures as are undertaken."

Haring remarks that, if treatment be adopted, the prognosis is in early cases good, but in advanced cases is less favorable.

Bosworth remarks that the Nodes are liable to return after destruction if the exciting causes - catarrhal laryngitis and excessive effort - be not removed.

Milligan referring especially to teachers, considers the prognosis, on the whole, good.

Knight believes that, in singers, the prospects of improvement depend on the duration of the condition, the opportunity, or the reverse, of resting the voice.
and lastly, the use of a good, or of a bad method of voice-production

Mackenzie points out that in singers the condition is often obstinate and frequently incurable.

Snitzler asserts that the prognosis is good and that perfect cures resulted in all his cases.

Watson Williams would warn us that the treatment requires patience and perseverance if any permanent benefit is to accrue.

Gottstein believes that the disease may remain stationary or spontaneously disappear.

Moure says that, in children, the prognosis is bad and that curative measures are disappointing.

My own observations lead me to believe that the Nodes disappear spontaneously only when they are small and when some evident cause for their presence exists, as for example, a fibroma on the opposite cord, exercising function and bringing into existence the Node. I have seen several cases in which the Nodes disappeared under treatment (without ablation of the swellings) but it was necessary to employ remedial measures for an extended period of time.
CHAPTER VII.

TREATMENT

PROPHYLAXIS

Milligan, speaking of female teachers believes that the age at which girls enter their life as instructors in elementary schools should be raised, and that they should not be allowed, as at present, to commence teaching so early as thirteen or fourteen. The holding of more than one "oral" or "noisy" lesson in a single room is a cause of vocal trouble in many cases. By an "oral" or "noisy" lesson is understood one in which children or teacher are talking or singing; it is of course the antithesis of a "quiet" lesson exemplified by a writing lesson. Milligan believes in the liberal use of class-rooms to which each teacher could retire with her class for "oral" lessons. Many of the present elementary school rooms are subdivided (if at all) merely by a thin partition or, worse still, a curtain hung across the apartment through which every sound is audible.

The pupils should be placed in tiers so that the teacher could hold her head up when speaking thus giving full play to the thoracic muscles, an immense advantage to an individual who has to speak for any length of time. Wood or asphalte pavements are desi-
rable in busy thoroughfares to deaden the street noises, and a short course indicating the principles of voice preservation and voice production would prove of value. The foregoing observations Milligan applies not only to the prevention of Nodges but also to allied morbid conditions which are the causes of vocal defects.

Haring remarks that in early cases before the formation of Nodges, that is, in those cases who are subject to excessive voice-strain and who already give evidence of catarrhal laryngitis, rest should be ordered, and the individual instructed to keep the head up when speaking, as recommended also by Milligan. It is necessary to avoid sudden changes of temperature and prompt attention should be given to catarrhal laryngitis when present.

Moure, referring to children, and going upon the assumption that such individuals tend to develop Nodges if made to take the alto parts in choir-singing, advises a strict classification of the youthful singers who are to take "seconds"; also all children who are in any degree hoarse should be forbidden to sing in choirs.

Delavan would exercise the prophylactic measure of not allowing children to attempt conversation with the deaf on account of the "dire effects" which follow such a course.
REMEDIAL TREATMENT.

Milligan, speaking of teachers, advises, in the earlier cases - when there is no actual Node formation but congestion and inflammatory thickening of the mucosa - physiological rest, which unfortunately, to be effective means a long rest, with the local application of mineral astringents and the cautious use of steam-inhalations. He has found the use of Leiter's coil over the larynx, for from half-an-hour to an hour at night, of value when laryngitis was present. If there be any paresis of the laryngeal muscles he has applied with success the continuous current over the region of the larynx. Milligan confesses to great disappointment from the employment of topical applications when definite Nodes had formed, but he believes that in those cases when the Nodes are large enough, the adoption of such a method of treatment as crushing with forceps or snaring is to be strongly recommended. He has, on one occasion, used the galvanocautery with, on the whole, a good result, but is rather diffident about the use of it fearing the dangerous sequel of cicatricial contraction.

Haring's treatment before the actual formation of the Node has been considered under Prophylaxis (p34). When the Node is present this laryngologist cocainises the larynx and touches the swelling with chromic acid fused on a probe. This procedure he repeats once or twice a week for a few weeks.
Mc.Bride is of opinion that no treatment may be required. He has used the galvano-cautery with success, in which statement he coincides with Snitzler this observer also uses Iod-glycerine in the after treatment.

Schrötter, quoted by Milligan, advocates squeezing the Node and applying solid nitrate of silver to its base. Morell Mackenzie advanced strong astringent solutions such as Perchloride of Iron ($\text{AgNO}_3$) or caustic solutions "and the employment of these was followed, in his experience, usually by a cure.

Bosworth, acting on the belief that laryngeal inflammation is the fons et origo of Nodes, insists strongly upon the eradication of the inflammatory process by topical applications. The voice is also to be rested. If these means fail he uses the galvano-cautery, observing the special precaution of turning the current on and off again immediately, to avoid injuring tissues other than those it is intended to destroy.

Watson Williams referring to singers, says the first injunction to be given the patient is "rest". When the congestion which is present has subsided, the Nodule should be removed by a sharp curette and a mild local astringent solution (e.g. Zinci-Chlor.) applied daily for a week. He approves of thuja given internally and applied locally, the Protoiodide of Mercury is also to be recommended, and lastly, he advises the correction of any faulty method of singing.
Illustration X
Rice's Laryngeal Snap-shot Guillotine

A. Trigger which releases one of blades of Ring-Knife C.
B. Arrangement for setting spring.
C. Ring-Knife with barbed prongs. The barbs had been taken off from the specimen photographed.
Knight relies on rest and astringents and if the Node did not disappear he would not hesitate to use Rice's Laryngeal Guillotine (Ill. 3).

Delavan suggests a sponge-probang for the removal of Nodes and Daly advocates scraping the Node off with the finger nail. Gleitsmann is a believer in the galvano-cautery and also values chromic or trichloracetic Acid fused on a probe. Langmaid prefers forceps for the cure of the condition. Murray and Wright believe in touching the Node with nitrate of silver fused on a probe. French relies on rest and astringents.

Rice, referring to singers, remarks that a good teacher of the art is most desirable in the treatment, prophylactic or remedial, of Nodes. The protuberances should be snipped off by the Laryngeal Guillotine invented by him (Illus. 3). After using the instrument Rice brushes the larynx with a solution of Chloride of Zinc (gr. 3 x 4) which, in his opinion, assists cicatrization better than the silver salts. Astringent sprays are to be employed every day for some weeks. When the cords are congested or thickened a solution of iodol or iodoform in ether may be applied periodically. If the tone of the muscles be lost, he advises the Paradic Current.

My personal observations of the surroundings of one hundred teachers leads me to believe that one
of the most if not the most powerful prophylactic agent would be the provision of abundant class-rooms so as to obviate the necessity of holding more than one class in the same chamber. I have met with a number of cases which appear to me to point to the conclusion that the aggregation of classes in the one room, however spacious, is the most potent factor in the production of Teacher's Nodes and other vocal defects in the individuals under discussion (\( \text{\textit{\textit{\textit{\textit{v. s. a}}}}} \)).

I will briefly recount two cases out of those, the consideration of which, has induced me to arrive at the foregoing conclusion.

(Case \( \text{\textit{\textit{\textit{VIII}}}} \)) Miss B. had been teaching 12 years. She had been hoarse for one month before presenting herself at the Manchester Consumption and Throat Hospital, when she was discovered to be suffering from laryngeal nodes. She had taught for one year in a room by herself without any appreciable vocal trouble; she was then drafted into a large and noisy school-room; in a few weeks she became hoarse and before the end of three months had developed nodes. (Case \( \text{\textit{\textit{\textit{II}}}} \)) Miss T. had been teaching for six years. She began to be hoarse and had lost the majority of her singing voice two months before I examined her throat. The larynx presented the appearance of Teacher's Nodes coupled with laryngitis. The patient had taught for several years (for the same number of hours as at
present) in a small quiet school without suffering in any degree from her throat. Eventually she became one of the teaching staff in a large school in Ancoats, an extremely populous district of Manchester. Sometimes as many as three "noisy lessons" were in progress in the same room, more often there were only two. There was a class-room but patient's class rarely went into it. The street, not a main thoroughfare, was quiet. By the end of her first two months in this school, "Teacher's Nodes" had developed, as proved by laryngeal examination. (Case VII) and (Case negatively) also appear to prove the potency of the absence of class-rooms in causing Chorditis Tuberosa.
Illustration 21
A patent Board Cleaner (1746)
The system of "dual desks", that is a division of the desks into couples, with spaces between the individual blocks instead of long rows of desks, is condemned by some teachers as being an extra burden on the vocal powers whilst others (and, of those I have questioned, the majority) are in favour of it, for although the spreading out of the class involves more effort for the teacher's voice, the better ventilation which accrues as a result of the system, and the greater ease with which each child can be reached, compensates for the foregoing disadvantage. Moreover, teachers tell me that for an "oral" lesson the class is rendered more compact by crowding the children somewhat together. It appears, therefore, that, on the whole, the abolition of "dual desks" would not be altogether beneficial.

Chalk dust has been proved by Ellis to be a source of irritation to the vocal cords. Moreover the discomfort induced by the suspended particles appears to have impressed the teachers to such an extent that a patent board cleaner has been supplied to several schools, thus displacing the time-honoured "duster". The apparatus consists of a wooden brush-back upon which has been fastened a species of felt about half an inch thick. This absorbs the dust and at the end of school-hours a pupil is despatched to strike the "Cleaner" against the wall of the school-yard and thus expel the chalk.
The rooms of a school should not be any loftier than is necessary to allow a sufficient modicum of air for each pupil, for if they be too high and church-like there is apt to be a waste of vocal power owing to the acoustic defects of such chambers for purposes of teaching. In one school which I visited I found an ecclesiastical-looking room (which had in fact been used at one time as a chapel) with a vaulted roof. The chamber was 70 feet long, 35 feet wide and 25 feet high; there were no partitions between the classes, and no class-rooms. The one room held, on an average, 220 children and 6 teachers. The latter, without exception, suffered from marked laryngeal fatigue at the end of the day's work, and in all save one — whose throat I did not examine — there was some abnormality in the pharynx or larynx (V Cases 39-43).

I believe that in many cases the classes are too large; about forty should on ordinary occasions be the number distributed to each female teacher and fewer than that if she be a young girl. Teachers have frequently told me that they have pretty often to take classes numbering upwards of a hundred pupils. These large classes occur more commonly in the Voluntary Schools than in those under the control of the School Board.

It has been suggested that a short course of instruction in the art of voice production should be undertaken before the teacher commences her duties. At
the least, if this be impossible, I believe that the intending instructor should be told to utilise to the utmost the lips, teeth, and other accessories to the organ of voice, much as in done by persons who habitually converse with the deaf, this saves the shouting which would otherwise be necessary to convey the sound.

The upright position of the head in speaking is, I believe, of much consequence. It is a well known fact that clergymen who speak down to their congregations are notoriously the victims of sore throat, whilst barristers who speak up to the jury comparatively rarely suffer from the affection.

Milligan's proposal to put down wood or asphalt paving outside such schools as are situated in noisy thoroughfares appears to me to present some difficulties. It is of course to be recommended where possible but the alternative resource of double windows in the schools themselves seems to be more practicable.

Lastly, I would advocate the use of wooden bricks in the flooring of the school. I have on several occasions contrasted the comparative quietude of schools possessing this arrangement—especially noticeable when the children are moving about—with the noise which ensues under similar circumstances in schools containing the ordinary boards.

I fear that it is suggesting a somewhat utopian scheme if all the indications for prophylactic
treatment contained in this paper be recommended, but by adopting the more important of them, and especially that relating to abundant class-rooms, much benefit both to teachers and scholars would necessarily accrue.

My experience of remedial measures leads me to believe that the treatment which appears to be most successful with the least menace of danger to the vocal cords is the application, to the cocainised bands, of chromic acid fused on a probe.

Rest of the vocal organs and astringent sprays (Zinci Sulph. $\frac{1}{2}$ X ad $\frac{3}{4}$) with sedative inhalations (Vapour Benzoin Co.), as in case IV and case V, have caused the Nodes to become much smaller in the first case, and one of the swellings to disappear in the second case.

The galvano cautery was used in case V with success as far as the destruction of the Nodes was concerned.

Curetting the Node I have known give good results both as regards the amelioration of vocal impairment and the diminution or disappearance of the Nodes.

The foregoing remedial measures are the only modes of treatment I have seen used or have employed myself, but owing to the necessity of training the larynx to submit to interference, the peculiar resistance of the swelling, frequently, to many of the forms
of treatment and to the impossibility, in numerous cases, of obtaining obedience to the precept of prolonged rest, the laryngologist is heavily handicapped, and much time and patience must usually be expended before patient and practitioner can obtain the mutual satisfaction of a cure.
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<table>
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<th>Table Showing Details of Cases of Hoarseness</th>
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**Notes:**
- Male: Male
- Female: Female
- Present: Present
- Absent: Absent
- Slight: Slight
- Moderate: Moderate
- Severe: Severe

**Vocal Impairment:**
- Hoarseness
- Vocal fatigue
- Vocal strain

**Pres. or Absence of Vocal Strain:**
- Present
- Absent

**Pres. or Absence of Vocal Interference:**
- Present
- Absent

**Pres. or Absence of Vocal Fatigue:**
- Present
- Absent

**Pres. or Absence of Vocal Strain:**
- Present
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**Pres. or Absence of Vocal Fatigue:**
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Although I have indicated in the text of the Thesis certain impressions which the Analysis of the foregoing tables fixed upon my mind, I feel hardly justified in drawing any conclusions which might be regarded as morally certain from from the present number of cases.

A. Table of 100 Female School-Teachers

1. 44 per cent of these Teachers examined were suffering from some definite lesion of the larynx or pharynx, leading to the supposition that throat disease, in certain forms, is common among female school teachers.

2. The commonest condition was some laryngeal anomaly, thus:

   Larynx abnormal in 34 cases
   Pharynx " " 30 "

3. The Laryngeal Abnormalities occurred in the following order of frequency:

   Catarrhal Inflammation of True Cords 16 cases
   Paresis of Certain Laryngeal Muscles 11 "
   Teacher's Nodes 7 "
   Tumour (Fibro-Papilloma) 1 "

54
4. A definite history of "Laryngeal" Strain was present in 30 cases; of these cases all but four shewed some lesion of the Pharynx or Larynx.

5. A markedly Hoarse Voice was present in six cases. I was struck by the fact that three of these were cases of marked Granular Pharyngitis, whilst the Larynx (after the most careful examination) was found to be normal (Cases 16, 32 & 50) of the other three cases one was a Fibro-papilloma (case 2), the second was subacute laryngitis with thickenings on the cords (case 15) and the third (case 31) was similar.

TABLE OF NODES.

In addition to the points noted in the text it appears that:

1. In 9 out of 16 cases the school arrangements were very defective - a prominent feature being the holding of several "noisy" classes in the one room.

2. In 5 there was a definite and in 4 a probable history of precedent attacks of laryngeal catarrh.

3. In 4 cases anaemia was distinctly marked.

4. In 15 cases out of 16 the Node was double.

5. In 15 cases out of 16 the Nodes occurred in Females.
### TABLE SHOWING RESULTS OF EXAMINATION OF 100 FEMALE SCHOOL-TEACHERS SELECTED HAP-HAZARD FROM THOSE PURSUING THEIR OCCUPATION IN THE CITY OF MANCHESTER.

<table>
<thead>
<tr>
<th>No.</th>
<th>Initial Description of School</th>
<th>Nature of School Arrangements</th>
<th>No. of Years Teaching</th>
<th>No. of hrs. per diem</th>
<th>Average Condition of Voice</th>
<th>Presence Condition of Pharynx</th>
<th>Condition of Larynx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Miss K.</td>
<td>Vol.</td>
<td>10</td>
<td>6</td>
<td>Good</td>
<td>Absent</td>
<td>Slightly congested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Noisy&quot; Classes in one room</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Miss H.</td>
<td>Vol.</td>
<td>10</td>
<td>6</td>
<td>Hoarse, not able to sing for 6 years</td>
<td>Present</td>
<td>Congested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fibro papilloma on left cord slightly thickening on right</td>
</tr>
<tr>
<td>3.</td>
<td>Miss D.</td>
<td>Vol.</td>
<td>10</td>
<td>6</td>
<td>-</td>
<td>Present</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Laryngeal Catarrh.</td>
</tr>
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<td>4.</td>
<td>Miss H.</td>
<td>Vol.</td>
<td>4</td>
<td>6</td>
<td>Hoarse</td>
<td>Present</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
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<td>Bad.</td>
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<td></td>
<td></td>
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<td>Laryngeal Catarrh.</td>
</tr>
<tr>
<td>5.</td>
<td>Miss N.</td>
<td>Vol.</td>
<td>16</td>
<td>6</td>
<td>Fairly clear</td>
<td>Present</td>
<td>Granular Pharyngitis</td>
</tr>
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<td>Bad.</td>
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<tr>
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<td>Bad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>7.</td>
<td>Miss D.</td>
<td>Vol.</td>
<td>7</td>
<td>-</td>
<td>do.</td>
<td>Present</td>
<td>Hypertrophy, especially of lateral folds; Pharyngitis sica</td>
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<tr>
<td></td>
<td></td>
<td>Bad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>8.</td>
<td>Miss H.</td>
<td>Vol.</td>
<td>4</td>
<td>-</td>
<td>do.</td>
<td>Absent</td>
<td>Enlarged right tonsil</td>
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<tr>
<td></td>
<td>Name</td>
<td>Grade</td>
<td>%</td>
<td>Hoarse</td>
<td>Tone</td>
<td>Normal</td>
<td>Pharyngitis</td>
</tr>
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<td>-----</td>
<td>--------</td>
<td>------------------------------</td>
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</tr>
<tr>
<td>9</td>
<td>Miss C. Vol.</td>
<td>3</td>
<td>6</td>
<td>Fairly clear</td>
<td>Present</td>
<td>Normal</td>
<td>Laryngeal catarrh</td>
</tr>
<tr>
<td>10</td>
<td>Miss D. Vol.</td>
<td>11</td>
<td>5.5</td>
<td>Good</td>
<td>Present</td>
<td>Granular</td>
<td>Loss of tone of cords</td>
</tr>
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<td>Miss C. Vol.</td>
<td>6</td>
<td>5.5</td>
<td>Good</td>
<td>Absent</td>
<td>Normal</td>
<td>Normal</td>
</tr>
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<td>12</td>
<td>Miss S. Vol.</td>
<td>2.5</td>
<td>6</td>
<td>Good</td>
<td>Absent</td>
<td>granular</td>
<td>Laryngeal catarrh</td>
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<td>Miss D. Vol.</td>
<td>9</td>
<td>6</td>
<td>Fairly clear</td>
<td>Present</td>
<td>granular</td>
<td>normal</td>
</tr>
<tr>
<td>14</td>
<td>Miss H. Board</td>
<td>12</td>
<td>5.5</td>
<td>Slightly hoarse</td>
<td>Present</td>
<td>Granular</td>
<td>Teachers Nodes</td>
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<td>Miss H. Board</td>
<td>7</td>
<td>5.5</td>
<td>Marked hoarse</td>
<td>-</td>
<td>Congested</td>
<td>Subacute laryngitis: nodeolar condition of cords but not true teachers NODES</td>
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<td>16</td>
<td>Miss W. Board</td>
<td>10.5</td>
<td>5</td>
<td>Hoarse</td>
<td>Marked granular</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>Miss</td>
<td>Board</td>
<td>Condition</td>
<td>Age</td>
<td>Voice</td>
<td>Health</td>
<td>Comment</td>
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<tr>
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<tr>
<td>17</td>
<td>Miss S.</td>
<td>Board</td>
<td>Defective</td>
<td>10½</td>
<td>Good</td>
<td>Absent</td>
<td>Granular pharyngitis, Catarrhal laryngitis, Paresis of Thyro-arytenoïdei.</td>
</tr>
<tr>
<td>18</td>
<td>Miss F.</td>
<td>Board</td>
<td>Defective many noisy lessons in common school room</td>
<td>14</td>
<td>5</td>
<td>Fair</td>
<td>Absent</td>
</tr>
<tr>
<td>19</td>
<td>Miss C.</td>
<td>Board</td>
<td>Defective</td>
<td>10</td>
<td>5</td>
<td>Fair</td>
<td>Absent</td>
</tr>
<tr>
<td>20</td>
<td>Miss W.</td>
<td>Board</td>
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<td>6</td>
<td>5</td>
<td>Good</td>
<td>Present (slight) Normal</td>
</tr>
<tr>
<td>21</td>
<td>Miss S.</td>
<td>Board</td>
<td>Fair: several class rooms. Street noisy.</td>
<td>8</td>
<td>5½</td>
<td>Usually hoarse</td>
<td>Present</td>
</tr>
<tr>
<td>22</td>
<td>Miss H.</td>
<td>Board</td>
<td>Fair</td>
<td>10</td>
<td>5½</td>
<td>Good</td>
<td>Present</td>
</tr>
<tr>
<td>23</td>
<td>Miss C.</td>
<td>Board</td>
<td>Fair</td>
<td>9</td>
<td>5½</td>
<td>Fair</td>
<td>--</td>
</tr>
<tr>
<td>24</td>
<td>Miss H.</td>
<td>Board</td>
<td>Fair</td>
<td>9</td>
<td>5½</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>25</td>
<td>Miss M.</td>
<td>Board</td>
<td>Good: several class rooms but very noisy street</td>
<td>14</td>
<td>6</td>
<td>Absent</td>
<td>Granular pharyngitis in adductors Loss of tone on phonation</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>Grade</td>
<td>Singing</td>
<td>Voice</td>
<td>Pharynx</td>
<td>Laryngeal catarrh</td>
<td></td>
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<tr>
<td>26</td>
<td>Miss R. Board</td>
<td>12</td>
<td>Fair</td>
<td>Singing</td>
<td>voice good</td>
<td>Present</td>
<td>Congested pharynx with varicose veins</td>
</tr>
<tr>
<td>27</td>
<td>Miss B. Board</td>
<td>6½</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Miss D. Board</td>
<td>6½</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Miss F. Board</td>
<td>20</td>
<td>Good</td>
<td>Good</td>
<td>Doubtful</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Miss N. Board</td>
<td>11</td>
<td>6</td>
<td>Good but has lost 2 of the notes in her upper register.</td>
<td>Marked granular pharyngitis</td>
<td>Granular pharyngitis</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Miss H. Board</td>
<td>7</td>
<td>-</td>
<td>Rough and masculine</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Miss W. Board</td>
<td>8</td>
<td>-</td>
<td>Hoarse</td>
<td>Marked</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Miss T. Board</td>
<td>4½</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Miss B. Vol.</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Miss T. Vol.</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Congested pharynx (slight)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Volume</td>
<td>Grade</td>
<td>Comment</td>
<td>Pharynx</td>
<td>Voice</td>
<td>Tonsils</td>
</tr>
<tr>
<td>---</td>
<td>----------</td>
<td>--------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
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<td>---------</td>
</tr>
<tr>
<td>36</td>
<td>Miss S.</td>
<td></td>
<td>7</td>
<td>Hoarse occasionally -</td>
<td>Congested pharynx (slight)</td>
<td>Paresis of tensors</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Miss C</td>
<td></td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>38</td>
<td>Miss M.</td>
<td></td>
<td>13</td>
<td>Hoarse often Present</td>
<td>Enlarged tonsils</td>
<td>Slight paresis of tensors</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Miss D.</td>
<td>Bad</td>
<td>9</td>
<td>6</td>
<td>Present marked</td>
<td>Granular pharynx with prominent varicose veins</td>
<td>Normal</td>
</tr>
<tr>
<td>40</td>
<td>Miss P.</td>
<td>Very bad. A large church like building; no class rooms and situated in a noisy street.</td>
<td>8</td>
<td>Has lost all her singing voice</td>
<td>Present marked</td>
<td>Normal</td>
<td>Slight laryngitis</td>
</tr>
<tr>
<td>41</td>
<td>Miss B.</td>
<td></td>
<td>9</td>
<td>5½</td>
<td>Singing voice lost</td>
<td>Present marked</td>
<td>Granular</td>
</tr>
<tr>
<td>42</td>
<td>Miss McD.</td>
<td></td>
<td>14</td>
<td>5½</td>
<td>Lost some of upper notes of singing voice</td>
<td>Present marked</td>
<td>Congestion of pharynx</td>
</tr>
<tr>
<td>43</td>
<td>Miss T.</td>
<td></td>
<td>7</td>
<td>5½</td>
<td>-</td>
<td>Present marked</td>
<td>Granular</td>
</tr>
<tr>
<td>44</td>
<td>Miss F.</td>
<td></td>
<td>8</td>
<td>-</td>
<td>Present marked</td>
<td>Granular</td>
<td>Pharyngitis of tensors</td>
</tr>
<tr>
<td>45</td>
<td>Miss R. Board</td>
<td>-</td>
<td>15</td>
<td>5½</td>
<td>Speaking voice hoarse</td>
<td>Present marked</td>
<td>Congestion of Pharynx</td>
</tr>
</tbody>
</table>

**Notes:**
- Miss S: Has lost all her singing voice.
- Miss C: Enlarged tonsils, Slight paresis of tensors.
- Miss M: Granular pharynx with prominent varicose veins.
- Miss D: Has lost all her singing voice.
- Miss P: Slight laryngitis.
- Miss B: Singing voice lost.
- Miss McD: Lost some of upper notes of singing voice.
- Miss T: Slight paresis.
- Miss F: Pharyngitis of tensors.
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Board</th>
<th>Age</th>
<th>Voice</th>
<th>Marked</th>
<th>Phonation</th>
<th>Details</th>
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<tbody>
<tr>
<td>46</td>
<td>Miss D</td>
<td></td>
<td>8</td>
<td>Rough</td>
<td>Present</td>
<td>Normal</td>
<td>Normal</td>
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<td>47</td>
<td>Miss M.</td>
<td>Board</td>
<td>17</td>
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<td></td>
<td>Granular pharyngitis</td>
<td>Slight paresis of tensors</td>
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<tr>
<td>48</td>
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<td>Board</td>
<td>12</td>
<td>5½</td>
<td>Slightly</td>
<td>Granular pharyngitis</td>
<td>Normal</td>
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<td></td>
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<td></td>
<td></td>
<td>rough</td>
<td>lost</td>
<td></td>
<td>(Slight)</td>
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<tr>
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<td>Miss B.</td>
<td>Vol.</td>
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<td>6</td>
<td>Present</td>
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<td>Chronic paresis of congestiva thyro-aryte-</td>
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<td></td>
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<td>Vol.</td>
<td>9</td>
<td>5½</td>
<td>markedly</td>
<td>Marked granular pharyngitis</td>
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<tr>
<td></td>
<td></td>
<td>do.</td>
<td></td>
<td>rough</td>
<td>and lost</td>
<td>and</td>
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<td>Normal</td>
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<td>Vol.</td>
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<td>Rougher than former</td>
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<td>of singing voice</td>
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<td>do.</td>
<td>10</td>
<td>Husky</td>
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<td>Board</td>
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<td>Rough</td>
<td>Normal</td>
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<tr>
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<td>Board</td>
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**NOTE:**

The thirty cases which complete those investigated presented no symptom, of any lesion and are therefore not tabulated, although included in the calculation of the percentage of cases of TEACHER'S NODES, and other abnormalities.