Staff Meeting Bulletin
Hospitals of the . . .
University of Minnesota

Laryngeal Obstruction

Volume VIII | Thursday, January 28, 1937 | Number 14

STAFF MEETING BULLETIN
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William A. O'Brien, M.D.

I. LAST WEEK

Date: January 21, 1937

Place: Nurses' Hall
Recreation Room

Time: 12:15 to 1:20

Program: Movie: China Clipper
Juvenile Delinquency

Abstract: Facial Neuralgia

Present: 118

Discussion: A. W. Adson

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II. MOVIE

Title: Geological Work of Ice

Released by: University of
Chicago Press

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III. OUR GUEST NEXT WEEK

EVARTS GRAHAM

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IV. LARYNGEAL OBSTRUCTION - TRACHEOTOMY

F. D. Hurd and L. R. Boies

Introduction

There seem to be misconceptions regarding the mortality and ill effects from tracheotomy. This review was suggested by that fact. The subject of laryngeal obstruction is considered in its entirety, however, in order to present a complete picture of present day standards in the management of this condition.

Definition

Laryngeal obstruction is an obstruction to the normal free passage of air through the glottis.

Etiology

Inflammations
- Acute laryngitis
- Diphtheria
- Laryngotracheobronchitis (fulminating type)
- Tuberculosis
- Syphilis

Tumors - malignant and benign
Paralyses
Foreign bodies
Edema due to instrumentation or allergic reactions
Congenital conditions
Laryngismus stridulus, web, etc.

Incidence

Acute inflammation as the most common cause of serious laryngeal obstruction is encountered most frequently in the large municipal hospitals having a busy contagion service. In the University of Minnesota Hospitals, these cases are uncommon.

A review of the experience of this hospital for the 5 years preceding January 1, 1937 reveals that laryngeal obstruction requiring surgical relief of a serious stridor, or in preparation for safe treatment existed in 71 cases. Seventy of these had tracheotomies, 1 had intubation.

Pathology

The narrowest portion in the lumen of the respiratory tract between the pharynx and bifurcation of the trachea is at the valve-like structure which forms the glottis. Inflammations, especially the acute streptococcic and diphtheritic infections producing edema and membrane formations, are the most serious conditions. The obstructing swelling is below the level of the cords in the subglottic area, and in the more serious cases the membrane extends down the trachea into the bronchi. Obstruction by tumor forms slowly and the most fre-

quent is carcinoma, and occasionally multiple papillomata and other benign growths. Paralysis of one side of the larynx may cause only a mild obstruction. Bilateral abductor paralysis is usually caused by injury to both recurrent laryngeal nerves in surgical procedures on the neck and produces a serious obstruction to respiration. Foreign bodies causing laryngeal obstruction must be large enough to lodge in the larynx. Occasionally tracheotomy is necessary to remove a foreign body from the trachea. Edema of a serious degree due to instrumentation occasionally occurs after bronchoscopy. Allergic reaction at the glottis of a serious degree is not common. Obstruction in the new born or young infant may be caused by weakness of the structure of the larynx (laryngismus stridulus), webs, anomalies of the epiglottis or subglottic area, etc.

Methods of Treatment

The necessities of the particular case determine to a large degree the method of relief used. Intubation or tracheotomy are the two time-honored methods. Recently the use of helium gas has been advocated by Baroch in certain types of obstructive laryngitis.

Historical

Asclepiades of Bithnia apparently saved several lives in the first century B.C. by opening the trachea. The procedure was known as bronchotomy. Aretius condemned the operation, however, as tending to increase tracheal inflammation and because of the fact that he believed that the cartilaginous parts would not heal together again. Antyllus in the second century B.C. called attention to tracheotomy in the treatment of cases of foreign body. It is recorded that an Arabian physician, Ion Zoar, divided the tracheal cartilages of a goat in order to prove that the cartilaginous would could heal.

Benevieni of Florence in the middle ages performed a tracheotomy on a patient with an abscess of the neck and cured him. Fabricius of Aqua Pendente suggested the use of a short, straight tube inserted into the tracheal wound and held in place with handles. Casserius suggested the curved tube of today some time during the 15th century. Bretonneau and Trousseau placed the operation on a high level with the recognition of the disease diphtheria.
--------Richards.

Intubation was apparently first used about 1858 by Bouchut who invented silver tubes which were carried into the larynx by a sound and held by a silver thread for extraction. Later, O'Dwyer of New York perfected the technique and instruments in use today.

Choice of Method

When the cause of obstruction is a tumor, paralysis, a congenital anomaly, or a chronic infection producing stenosis, tracheotomy is the unquestioned procedure in view of the prolonged treatment necessary. To relieve an obstruction due to an acute inflammation, the edema which occasionally results after instrumentation, an allergic reaction, etc., intubation has a distinct usage, but there are definite situations in which tracheotomy is the procedure indicated.

The following considerations are important:

1. Intubation is a relatively simple procedure quickly accomplished in the hands of an experienced operator. However, it demands that an experienced intubator be quickly available to put the tube back once it is coughed out.

2. Repeated intubations or prolonged use of an intubation tube produces an irritation in the subglottic area which may cause stenosis. "Tracheotomy conserves the laryngeal structure better than intubation in infants." (Tucker)

3. An infant will not take food or fluid by mouth satisfactorily with an intubation tube in place.

4. In the presence of an infection producing a membrane below the glottis as in an acute laryngotracheobronchitis, an intubation tube is inadequate. A tracheotomy, in addition to providing an adequate airway, facilitates removal of the inspissated secretions and offers drainage. The factor of drainage provided by tracheotomy in the acute fulminating infections has probably been overlooked.

5. The fact that a tracheotomy opening does not admit air warmed and moistened in the upper respiratory tract has been shown from clinical experience to be an unimportant consideration. The use of a warm steam room is a satisfactory substitute.

Tracheotomy

The old descriptive terms of a high, median or low tracheotomy have been discarded. All tracheotomies should be low except those preliminary to laryngectomy when conservation of as much of the trachea as is possible is important.

Tracheotomies may be conveniently classified as "emergency" or "orderly"; some writers prefer the terms "necessary" and "elective." Emergency tracheotomies may still be orderly in cases of extreme dyspnoea. The use of a bronchoscope or Mosher life-saving tube inserted through the glottis changes the procedure from an acute emergency to an orderly one and produces a more satisfactory and a safer technical effort.

We prefer the removal of a disc of cartilage slightly larger than the tube to be inserted. The incision, unless unusually long, is not sutured. Drainage around the tube is important and suturing causes more reaction and a tendency to emphysema. Experimental work (Richards and Glenn) has shown that this type of opening does not interfere with the patency of the tracheal lumen after the tube is removed and healing has taken place. It seems illogical to insert a tube through a narrow longitudinal or transverse slit with the resultant tension on the margins of this slit. An adequate opening facilitates exchange of tubes with the least amount of irritation. It also facilitates the matter of drainage from the trachea.

There seems to be a tendency to use too small a tube. Clinical observation indicates that the size of the lumen is not a factor in producing irritation in the trachea. In this respect only the length of the tube is important. The larger the lumen of the tube the less the tendency for it to clog with mucus to an extent to interfere with an adequate airway. A larger lumen is also easier to keep clean.

Nursing care of tracheotomized patients by those experienced in the management of this type of care is extremely important.

Tracheotomy wounds tend to heal promptly without surgical interference even though tubes have been worn for months.

Patients are surprisingly comfortable in permanent tracheotomy. Tracheitis and bronchitis are uncommon after the variable amount of this reaction present in the first few days after the operation. There seems to be no increased susceptibility to pneumonia. Thomson and Wood have each reported a case of tracheotomy tube worn over 70 years. Wood remarked that his patient claimed that she had never had bronchitis.

Summary of Cases of Tracheotomy in the University of Minnesota Hospitals in the 5-year Period prior to January 1, 1937:

Diagnosis:

Tumor of Larynx	
Carcinoma	32
Chondroma	1
Multiple papillomata	2
Tumors adjacent to the glottis causing obstruction by reason of extension or metastasis (upper end of esophagus, pharynx, epiglottis, piriform sinus, tongue, oral cavity	16
Acute infections in pharynx or larynx with or without abscess formation	4

Bilateral abductor paralysis (following thyroid surgery)	2
Traumatic stricture from fracture of larynx	1
Traumatic edema from a blow on the larynx	1
Trauma following bronchoscopy (F.B.)	2
Involvement of the larynx due to syphilis, tuberculosis, leukemia (one each)	3
Pressure on trachea from an aneurysm of the innominate artery	1
Pressure on trachea from enlarged thyroid	1
Acute laryngotracheobronchitis	2
Foreign body removed through tracheotomy opening	1
Thyroid surgery	1
Total	70

Ten of the 70 tracheotomies were performed by general surgery; the other 60 were done on the laryngologic service. There were 11 deaths, 3 occurring at the time of tracheotomy and 8 within a few hours or days of the operation. A study of the death cases indicates that it would be incorrect to designate those as surgical mortalities due to tracheotomy inasmuch as in most of these cases death seemed imminent regardless of the relief of the laryngeal obstruction.

Thirteen of the 70 cases can be classified as emergency with 4 deaths; the remainder may be termed orderly. In the 57 cases comprising the latter group, 29 were necessary and 28 could be classed as elective.

There were no cases in this series of tracheotomies in which some degree of obstruction to respiration did not exist, although in some instances it was only of a moderate degree. This series represents only the cases of laryngeal obstruction in which relief was necessary due to a serious embarrassment to the free passage of air, or in which tracheotomy though unnecessary at the time was done to make such a procedure as total or partial laryngectomy safer, as for such procedures as the administration of x-ray or radium.

Not considered in this study are cases of mild laryngeal obstruction treated at the University of Minnesota Hospitals during the same period. These cases consisted of: acute laryngitis relieved by laryngoscopic suction and rest in a steam room or tent, unilateral vocal cord paralysis, benign small tumors of the larynx such as papilloma, angioma and fibroma, congenital anomalies, laryngismus stridulus, etc.

Two hundred and eighty-three bronchoscopies were performed during this period, 38 for removal of foreign bodies of which 3 were tracheotomized, and 245 for diagnosis or treatment. Two cases required relief of obstructive dyspnoea due to instrumentation for the removal of foreign bodies, one of which was a repeated procedure.

Review of Literature

The modern literature related to the subject of laryngeal obstruction concerns itself chiefly with the management of obstructive laryngitis as (1) a problem in laryngeal diphtheria, (2) a disease entity recognized since 1915 as "acute laryngotracheobronchitis," and (3) the present standards of performing and management of tracheotomy.

Platou and Hilleboe reviewed 352 cases of obstructive laryngitis treated at the Minneapolis General Hospital in a 12 year period; 103 patients died, a mortality of 29%. Thirty-five of the cases died during or shortly after admission. These are therefore excluded in a consideration of the effectiveness of various methods of treatment. Of the 317 cases studied, 255 were diphtheritic and 62 non-diphtheritic. The cases were classified as (1) minimal, (2) moderately advanced, and (3) advanced. The incidence of each group, method of treatment and mortality was as follows:

Diphtheria (255 cases)

		Treated Medically	Mortality	Operated	Mortality
Minimal	117 cases	65	9%	52	17%
Moderately advanced	52 "	1		51	14%
Advanced	86 "	68	18%	29%	67%
	255 cases	Total mortality 17%.			

Non-Diphtheria (62 cases)

Number	Per Cent		Intubations	Mortality
26	42	Acute simple laryngitis	4	0
24	37	Acute exudative laryngotracheitis	Intubation or tracheotomy not recorded.	74%
12	21	"Miscellaneous"	Intubation or tracheotomy not recorded.	66%

62 cases. Total mortality 40%.

The authors emphasize the importance of direct laryngoscopy in the diagnosis and treatment of obstructive laryngitis, and training in the diagnostic use of the laryngoscope in graduate study in pediatrics.

Richards reported 11 cases of fulminating laryngotracheobronchitis from the Children's Hospital of Boston; 7 of these cases ended fatally. The disease picture is described as an acute infection of the upper respiratory tract characterized by a high febrile reaction, and an intense inflammatory change in the mucous membrane and the walls of the trachea, bronchi, and bronchioles, and accompanied by the formation of a sticky, gummy, often glue-like exudate or secretion practically or completely occluding the upper airways. The occluding secretion may extend upward to become attached to the glottic walls or the infection may spread downward to fill the terminal bronchioles and alveoli, and hence to produce a bronchopneumonia. Pure cultures of streptococcus were found at autopsy. The staphylococcus and pneumococcus were secondary invaders.

The disease usually begins with a more or less mild upper respiratory infection, gradually developing into a croup. An increase in the febrile manifestation with the gradual development of stridor follow. The dyspnoea becomes worse, supraclavicular, suprasternal and epigastric retraction indicate the patient's effort at adequate respiration. A pale cyanosis develops indicating the patient's exhaustion. Hoarseness may not be marked because the swelling is usually subglottic, and on laryngoscopic examination a narrow chink is visible through the subglottic area. The relief from tracheotomy is usually dramatic but as the glue-like secretion extends downward the dyspnoea recurs. Bronchoscopic removal of this sticky substance brings relief. If the trachea and bronchi can be kept free of this secretion and bronchopneumonia does not develop, survival of the infection may be expected. The disease is most commonly encountered under 4 years of age.

In the 11 cases reported by Richards, tracheotomy alone was done in 5 cases and intubation and tracheotomy was done in 1. There were no survivals in this group. In the other 5 cases, intubation alone was performed and 4 recovered. Richards concludes, however, that this experience does not support intubation as a superior method of handling the obstruction in this disease. The cases intubated were apparently less seriously involved.

Gittins reviewed 24 cases of laryngotracheobronchitis. Fifteen required tracheotomies and of those 7 recovered and 8 died. There was 1 death among the remaining 9 which were not tracheotomized. He comments that these cases were less severe than the 15 requiring tracheotomy. The 1 death in this group of 9 was seen in extremis. Gittins' remarks, "We feel that in non-diphtheritic cases intubation is a dangerous procedure in most instances." This is because it is an inadequate procedure.

Raum reviewed 24 cases of laryngotracheobronchitis in which 18 were due to epidemic acute respiratory infection, 2 were secondary to measles and 4 were subsequent to a foreign body. There were 10 fatalities. All the fatal cases were instances in which the epidemic respiratory type of infection caused the illness.

Figi reviewed an experience with 206 tracheotomies on 200 patients in a 4½-year period prior to January 1, 1929 at the Mayo Clinic; 174 were operated on the laryngologic service and 32 on the general surgical service; 71 operations (34%) were emergency measures and 135 (65%) were carried out as a matter of expediency to lessen risk of laryngeal surgery or to obviate impending respiratory obstruction. There was no immediate mortality, 18 died subsequently.

Tucker from his studies on the infant larynx concludes that "tracheotomy conserves the laryngeal structure better than intubation in infants."

Jackson states that acute laryngotracheobronchitis occurs most often and most severely during epidemics of so-called influenza. In 3 to 5% of the cases, the influenza bacillus seems to be causative; occasionally other organisms seem responsible; but over 90% of the cases are primarily or secondarily streptococcic. The mortality in children under 3 years is about 70%. In acute laryngotracheobronchitis, the outstanding feature of the bronchoscopically observed pathologic condition is the bronchial obstruction by inspissated secretion which the weak or absent cough reflex is unable to expel. Therefore, the following points are important in the treatment of this disease:

(a) The routine administration of atropine or opium derivatives is illogical in theory and often fatal in practice.

(b) The superheating of the air in our hospitals and dwellings contributes largely to inspissation of secretions. Outside air at zero contains little water even at the dew point. When we heat this air to 70°F. it becomes extremely dessicating to the secretions and almost caustic to the mucosa. The air surrounding the patient with laryngotracheobronchitis with inspissating secretions should be humid to saturation.

(c) In this disease, an impaired percussion note and increased respiratory rate usually mean not pneumonia or bronchopneumonia but obstructive atelectasis.

(d) These signs call for peroral or tracheotomic aspiration of secretions. In extreme cases, forceps removal of crusts is the only means of saving life. Such potentially fatal circumstances can be prevented by humid air and the avoidance of atropine, opiates and other dessicating medicaments.

Phelps reviewed a personal experience with 15 cases of laryngeal emergency in infants and children. He emphasized the ease with which direct laryngoscopy makes possible an accurate diagnosis even when used in the home.

CASE REPORT

- Female, age 30.

History of chronic laryngitis - observed in the Out-Patient Department. Subglottic swelling prominent. This became worse. General physical examination, including chest x-ray, sputum study, urine and blood, negative. Basal metabolic rate, -19 to -24. Put on thyroid extract gr. iss b.i.d. Biopsy recommended.

11-22 - Direct laryngoscopy and biopsy taken. Went home the same day.

11-23 - Admitted to hospital with acute laryngeal obstruction. Put in steam tent.

11-24 - Temperature up to 100°. Tracheotomy necessary. Relieved.

11-25 - Temperature up to 103°.

11-26 - Dyspnoeic with cyanosis. Bronchoscoped. Dried mucous plugs removed from trachea. Temperature up to 103.6°. Bronchoscoped again the same evening. Dried secretion and membrane removed from trachea and bronchi.

11-27 - Bronchoscoped twice with improvement after each treatment. Lipiodol instilled to liquefy secretions.

11-28 - Bronchoscoped once.

11-29 - Bronchoscoped once.

Gradual improvement with subsidence in temperature in the following week. Slow convalescence. Decannulation not completed for 2½ months.

Comment

This case represents an acute laryngotracheobronchitis following an acute exacerbation of a chronic laryngitis. It is not typical of the usual age group nor in the fact that it complicated a chronic laryngitis. The management is, however, representative of that necessary in this condition. The fact that the patient was an adult probably made the prognosis more favorable.

Summary

1. Seventy tracheotomies were performed in the University of Minnesota Hospitals in a 5-year period prior to January 1937. Death followed at the time of operation in 3 cases and within a few hours in 8 more cases. A study of the records of the fatal cases indicates that in each instance the patient was being treated for a serious illness. It would be incorrect, therefore, to consider the death as a surgical mortality due to tracheotomy.

2. The tracheotomies performed on the other 59 cases were followed by no complications attributable to the tracheotomy. Prolonged wearing of the tube in some cases did not make the patient more susceptible to respiratory infection.

3. In the same 5-year period, only 1 cases was intubated. This was done for edema following bronchoscopy. In this period, 283 bronchoscopies were performed. Three of the bronchoscoped cases required tracheotomy for removal of the foreign body.

4. The fact that very few cases of diphtheria or other contagious disease are admitted to this hospital accounts for the low incidence of laryngeal obstruction requiring surgical relief in the form of intubation.

5. The modern literature dealing with laryngeal obstruction and its surgical relief is concerned chiefly with the management of obstructive laryngitis in diphtheria, and a clinical entity recognized since 1915 as laryngotracheobronchitis.

6. Laryngotracheobronchitis is a severe infection of the respiratory tract usually encountered in children and apparently most often streptococcic in origin. It is characterized by the gradual development of dyspnoea, toxicity, and pale cyanosis brought on by exhaustion in the attempts to get air. Tracheotomy and the bronchoscopic removal of the inspissated secretions which become glue-like in their consistency offer the only hope of cure in the severe cases. There is usually considerable subglottic swelling and the secretions adhere to the walls of the trachea and large bronchi.

7. The potential seriousness of all cases of croup emphasizes the importance of adequate early care. Most writers stress the importance of a warm himid air and condemn the administration of atropine or opiates.

8. Direct laryngoscopic examination for diagnosis and the use of suction to remove obstructing secretions are important in the early management of all cases of obstructive laryngitis.

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V. GOSSIP

One time Radiological Fellow Theodore M. Berman writes from Miami Beach, Florida that he is enjoying his work at his new location in the Alton Road Hospital where he is pathologist and roentgenologist. The hospital is a newly built 60-bed institution, catering primarily to those who visit the South to escape winter. Dr. Albert Levine, one of our former graduates, is also located there. Both send the usual message from the South -- "Wish you were here." Ted Berman, the cuckoo bird of the Record Room (she lays her eggs in the other bird's nest), used to drop in a little Yiddish whenever he saw a partially completed Ediphone cylinder, much to the amazement and bewilderment of the stenographic force. One time Pathological Fellow Bjarne Pearson, now on the staff of the Pathological Department of L.S.U., used to put a little bedtime story on the end of his cylinders in the form of a Swedish lullaby.....Speaking of letters, the following was received this week by one of our staff: "Rec'd your letter of December 29, 1936 and want to thank you for your reply. I stopped menustrating when I rec'd your letter and today it has started over again, but don't know how long it will keep on. Have been losing weight wonderfully. I weigh 215 lbs. now, but my health has been failing me."....Fritz Draper Hurd, our author today, is well known not only to our present group but also to those who were in school when he took his undergraduate work and internship. In the interval, Fritz was rapidly becoming a substantial citizen in North Dakota when he decided to come back for some graduate work in otorhino-laryn-

gology. His fellow citizens elected him State Senator on a very unusual platform. He promised them nothing, did not campaign, but said if he was elected he would serve them to the best of his ability. All of this appeared in a newspaper notice early in the campaign. The next thing Fritz knew, he was elected. To make it more impressive, they sent him back the second time on the basis of his record. We are very grateful to him for his contribution today which he does not consider an abstract.....The first week's Institute at the Continuation Study Center was a success. Fifteen students went home Saturday night feeling that it had been worth while. Most pleased were those who lived in the building and took their meals there. A certificate of attendance was granted to all who spent full-time at the course. This week's course in Obstetrics and Gynecology is equally interesting and as well attended. About one-half of the group remained from last week's course in Traumatic Surgery. Pediatrics will be offered next week and Internal Medicine the last week. As soon as this Institute is over, a study will be made of our first effort and immediate steps taken to plan more groups. It is assumed that every physician in the Northwest, and all our graduates, are potential students if we can determine what their interests are and how we can serve them. Medical educators who came to study the first courses insist that within a few years we will be operating our share of the Center's programs on a year round basis and attracting students on a national scale.....Dr. Evarts Graham will be our guest next week. The subject will be "The Gallbladder." The staff is urged to call this meeting to the attention of anyone who might be interested. While here to deliver the Judd lecture, Dr. Graham will meet with our local surgeons in connection with the organization of the American Board of Surgery.....Chief Radiologist Leo George Rigler has an illustrated talk on the "Modern Use of the X-ray" which is delighting many audiences throughout the city and state. Some of the views are rather unusual, including the picture of a young university man's skull, who is doing badly in his school work. His cranial cavity seems to be filled with females dancing and otherwise, which is apparently the old variation of "women on the brain." Another one shows that an unusual package a man received from an unknown admirer contained a bottle which looks like it might contain spiritus fermenti. In addition, there are many slides showing the more conservative side of diagnostic roentgenology.....The Eitel Hospital staff had its annual dinner meeting at the Radisson Hotel last evening. This was the third of their series of functions and each one gets a little better, which reminds us that we might think about having an affair of our own. There are many possibilities. In the good old days, our students used to do a pretty fair job of imitating their elders. I imagine that a great many of our senior staff men would be surprised to know how many of the juniors can give "the old line."....Deskman Charles Spencer Hayden, one-time student in anthropology, now studying medicine, still yearns for his first love. Few anthropologists are medically trained; all feel the lack of exact anatomical knowledge. While on summer expeditions deskman, anthropologist, medic-to-be Hayden had many an interesting experience. None intrigued him quite so much as his part in scraping the bones and other relics of the Minnesota man, anthropology's oldest discovery. Found by a road crew near Detroit Lakes, Minnesota, studied by geologists and anthropologists, the find is estimated to be between 18,000 and 20,000 years old. And, believe it or not, the skeleton reveals that the Minnesota man is a woman.....When Larry Boies came to our hospital a few years ago, few suspected that such a small, calm package could contain so much energy and enthusiasm, but few men in recent years have given so much in otolaryngology and won the esteem of so many of his associates. His organization of out-patient teaching would be contribution enough.....When Pediatrician Erling Platou was called to Rochester, his associate, Chester Stewart, readily agreed to come and show his movie today on the medical treatment of laryngeal obstruction. Thank you.....

Adios.....