FIG. 22. This plate is sold in drug stores and shoe shops, but it has the advantage over many prescribed plates in that the split flange on the inside is bent out of the way by the action of the strong foot.

FIG. 23. A turned shoe — sells for 90 cents. This shoe shows the mobility of a mechanical moccasin having nothing to restrain action of foot or ankle.

erty of foot-action, such as comes with rational shoeing, is universal in its benefits. All the civilized world from childhood to age needs foot-freedom. The moccasin would allow it and be feasible if we could still walk, as in the beginning, on the mould of the forest and the turf of the fields. To accommodate the flexible arching foot to the unyielding planes on which we must walk, the shoe must offer a series of unstable balancing platforms with nothing fixed in position. Such shoeing, to one accustomed to the tight, unyielding leather boxes of present use, makes walking a new function, a revelation of comfort.

ROSENMUELLER'S FOSSÆ AND THEIR IMPORTANCE IN RELATION TO THE MIDDLE EAR.*

BY FRANCIS P. EMERSON, M.D., BOSTON.

THE object of the following paper is to try to point out an important source of infection of the middle ear, which has heretofore been overlooked. The literature, clinically, is exceedingly meager, consisting of one paper by Dr. Brunk, which appeared in the August number of the *Laryn-*

* Read at a meeting of the New England Otological and Laryngological Society, Nov. 17, 1907.

goscope. With this timely and excellent paper, I fully agree. The textbooks, as he pointed out, even the latest, have nothing to offer. Notwithstanding this, I shall try to show that in the fossæ of Rosenmüller there is to be found very frequently, in adults, as well as in children, a large amount of degenerate tissue. This is more constant than we have supposed, and is an important factor in causing or maintaining morbid conditions of the middle ear. When present, it can be seen by posterior rhinoscopy in only a small per cent of cases, therefore a digital examination is necessary for diagnosis, and this should be done as a routine procedure.

Anatomically, Kyle says, "The third or pharyngeal tonsil differs little in structure from the faucial tonsils." This tonsil extends from the median line on each side to a well marked depression termed the fossa of Rosenmüller or recessus pharyngeus, which separates it from the Eustachian orifice. The agglomerate glands are most numerous behind the projections which contain the Eustachian orifices (i. e., in the recessus pharyngeus) and are closely grouped together on the upper surface of the soft palate. The term "adenoid vegetations" includes enlargement not only of the pharyngeal tonsil, but also of the closed follicles situated in the mucous membrane of the posterior surface of the vault and the postero-lateral walls of the nasopharynx. Later, he adds that, "pathologically, we really have to deal with four different varieties of enlargement of the pharyngeal tonsil," and says that "there is a soft variety which appears as a smooth semi-fluctuating mass that spreads over almost the entire nasopharynx, which is largely influenced by atmospheric changes and the physical condition of the child." This variety is composed almost entirely of the lymphoid structure, is very friable and is covered with a thin layer of epithelium, with ill-formed basement membrane and submucosa. The structure is so soft and friable, that it can easily be broken up by pressure with the finger. The enlargement seems to be due to an over-development of lymphoid tissue.

In another variety, which may be called edematous or cyanotic, there is very little increase in the actual gland structure, but the enlargement is due to venous stasis and edema produced by leakage from the vessels. This is the variety that is directly associated with intestinal irritation and irregularities in systemic circulation most commonly observed in children who are suffering from some form of intestinal parasites. The structure is smooth and tense, although easily compressible.

In the hard or hyperplastic variety, there is an increase in the lymphoid structure, with a decided overgrowth in the connective tissue element. The mucous membrane lining is well formed, and there are usually several layers of epithelial cells. The surface is more lobulated, although smooth to the touch.

Clinically, it would seem to be the first variety which by retrograde change produces the patho-

logical conditions found in the fossæ. This tissue normally should undergo physiological atrophy from the tenth to the fifteenth year, but digital examination shows it to be still present in the fossæ. It is, I believe, an active factor in the causation of recurring attacks of salpingitis in adult life. Its position and constant reinfection may be one of the active causes of lateral pharyngitis. The investigations of Goodale and others in tracing the focal source of infection of the cervical and bronchial glands, as well as the apex of the lungs, to the tonsil and adenoid tissue, must lead us also to have the fossæ of Rosenmüller in mind. This is particularly true, as often the recessus pharyngeus is very deep and contains a large amount of soft, friable tissue, offering an ideal harbor for micro-organisms. The lymphatic connection with the cervical nodes makes the fossæ second only to the tonsil as a direct source of infection. With the Eustachian tube, it not only from its position offers a harbor for bacteria, causing a low grade inflammation, which infects its orifice, but mechanically it interferes with the action of the levator palati muscles. That it is an important factor in obstructing the venous return current from the tympanum and labyrinth is shown in the marked relief of some cases of tinnitus.

This was shown in instances where the tube was not occluded, and therefore could not be attributed to ossicula impaction from atmospheric pressure. Clinically, its arrangement is as follows:

Fig. 1. One or more bands pass from the posterior and upper part of the recessus pharyngeus to the Eustachian tube. These can be seen by post-rhinoscopy.

Fig. 2. The entire fossa is filled with a soft friable mass that is smooth and which cannot be seen by the eye. The finger, however, sinks into and easily removes it. In this class the recessus is deep and there is a large amount of tissue, which bleeds almost as freely as at the average adenoid operation.

Fig. 3. The recessus is studded with irregular masses, which may be scattered, though not large in amount. Objectively, then, we do not have anything pathognomonic, as this condition may be associated with chronic secretory or suppurative otitis media and locally it can only be detected by digital examination. Clinically, however, there is a very definite picture. These patients complain not so much of absolute as of relative deafness, i. e., their hearing fluctuates and is influenced by changes in weather, dust and physical conditions. They feel as though there is something over the affected ear or ears. There is tinnitus and referred abnormal sensations in the throat. The hearing test is normal for a long time. If they have an acute infection, it recurs constantly on the same side.

The correction of abnormal conditions anterior to the vault does not protect the patient from subsequent attacks of salpingitis. These are the cases that have obtained temporary relief by the use of silver nitrate to the vault and

catheterization or, if there was a more acute condition, the Politzer bag. As in the nasopharynx, all palliative measures are being supplanted by surgical procedures, so here is one more reason for discontinuing the use of the much-abused catheter. That the Eustachian tube will open physiologically and remain open, if we can prevent or cure the inflammation of the tissues about its orifice, I believe to be the trend of opinion among otologists. Those who hold this view find less indication for continued treatment by inflation. The influence of pathological conditions of the recessus pharyngeus in continuing a suppuration of the middle ear over a long period is shown in Case I, which was unmodified for four years by hospital and private care.

CASE I. June 6, 1906. Miss M. C. Hospital. American, sixteen years. Born in Massachusetts. Gives a history of chronic suppuration since childhood. During this time, the right ear has not been dry except for a period of two months, two years ago, while in the hospital for an adenoid operation. The left ear has discharged intermittently. She has been treated regularly at the hospital during this period and has had an ossiculectomy, besides an adenoid operation. The middle ear was cleansed carefully with a middle ear syringe. She is of more than average intelligence and has followed directions carefully at home. During the last two years, she has been under the constant care of one of our best men as a private case. She says that during this time there was no improvement that she could see. On June 6, the fossæ were cleared of a mass of soft degenerate tissue that bled as freely as at the average adenoid operation. Within twenty-four hours, the right ear became dry and has remained so. The left ear showed possibly two or three drops of pus. Although the right ear has been dry only two weeks, it followed immediately the clearing of the fossæ after treatment had been ineffectual for years.

In Case II., the effect on tinnitus and referred sensations in a chronic secretory ear is hardly less striking.

Sept. 6, 1906. Miss H. T. Private case. American. Schoolgirl, sixteen years. Born in Massachusetts. B.—O. M Sec. C.—R. Tinnitus is continuous. Hearing fluctuates. Stuffy sensation in the ears.

Previous history.—Nose was cauterized and tonsil cut four years ago.

Examination.—Right tonsil, upper angle not clear. Left tonsil, central mass present. Right Rosenmüller's fossa filled with soft granular tissue.

Treatment.—Rosenmüller's fossa freed and treated twice with iodo-glycerin.

Result.—Tinnitus and abnormal sensations stopped in twenty-four hours and have not returned. There has been no reinfection of the right tube.

Although these two examples are hardly fair representatives of each class, they are by no means unusual, especially in private cases that report for treatment until the pharyngeal mucosa has been restored to its normal function. The technic which I have employed to free the fossæ is very simple and requires no anesthetic. Standing on the right, the left arm is placed around the neck of the patient and a wooden tongue depressor introduced between the teeth to protect the forefinger of the right hand, which is passed behind the soft palate. At this stage, I wait until the patient is assured that he will not

be choked and respiration has become regular. This relaxes the soft palate and the finger passes through one and then the other fossa, with very little discomfort. A simple spray of cocaine can be used for the hypersensitive.

I have found degenerate tissue so often and its removal has been attended by such immediate results, that I do not feel justified in subjecting a patient to prolonged treatment without digital examination of the fossæ without reference to age. This conclusion has been reached after the examination of over 100 hospital and many private cases, extending over a period of over four years. It is done immediately if they present the classical symptoms of stuffiness, fluctuating hearing, tinnitus and recurring unilateral salpingitis.

Some of the following cases were reported at a meeting of the Roxbury Clinical Record Club a year ago, before Dr. Brunk's paper was published. I offer this statement, not with any idea of claiming priority, but to show that we have been working along the same lines and have come independently to the same conclusions. Through the courtesy of Dr. Jack, in the fall of 1905, I followed the history of 12 cases to note the effect, if any, on tinnitus. In early cases this procedure was more immediately beneficial and lasting than any with which I am acquainted. This is shown in Case III, where there were distinct bands, which could be seen with the mirror.

CASE III. Nov. 6, 1906. Mrs. G. H. B. Born in Nova Scotia. Repeated sore throats as a child but no sickness since. Comes for tinnitus especially after colds.

Examination. — Distinct bands in both fossæ which can be seen with a mirror. A small amount of adenoid tissue on each lateral wall at the margin of the fossa, from which the bands start. Hearing normal. B.—O. M. Sec. C.

Treatment. — Bands removed under gas. Topical applications to the fossa.

June 12, 1907. No return of the tinnitus.

It is obvious first that in freeing the fossæ we not only remove a mass of degenerate tissue, which keeps up a low grade inflammation, subject to acute exacerbations and reinfections that are communicated to the Eustachian tube, but, second, we deplete the engorged blood vessels and relieve stasis more effectively than by any topical application, and third, we allow deglutition to once more exert its physiological action on the tubal muscles in normally ventilating the middle ear. Cases could be multiplied indefinitely, but as the results follow in so short a time, the patients cease to report for observation.

CASE IV. July 23, 1906. J. C., twenty-eight years. Single. Born in Cambridge. Hospital. Teamster. B.—O. M. Sec. C. Hearing normal. Ears feel closed, as though there was a cloud over them, especially on a dull day. Better, clear days. Tinnitus (steam) constant at night, intermittent during the day. B. fossæ filled with a soft glandular tissue, which bled very freely on removal. Oct. 29, tinnitus gone. Hearing more constant. Still feels that one ear is closed and is relieved by inflation.

CASE V. Jan. 15, 1906. Miss H. B. J. Hospital. American. Bookkeeper, twenty-seven years. B.—O. M. Sec. C. Hearing normal. Naso-pharynx clear except fossæ which contain soft granular tissue. Left ear tinnitus like a whistle and is continuous. Right ear tinnitus like wind and is continuous.

Treatment. — Fossæ freed with the finger.

Result. — Tinnitus not noticed except a very little at night.

In the following case prolonged treatment for a year of the anterior naris and vault had not given any relief to the tinnitus. This consisted of the removal of adenoids and surgical measures directed to the septum and middle turbinates followed by topical applications and sprays for the naso-pharyngitis. The tinnitus was so pronounced as to interfere with her work and sleep.

Treatment. — The fossæ were freed digitally.

In response to a letter of inquiry, she replied in person and said that during the last year she had been free from symptoms.

CASE VI. Jan. 15, 1906. Mrs. C. H. R. Thirty-one years. American. Housewife. Hospital. Hearing right 2-25 watch. Dench 80, otherwise normal.

Naso-pharynx clear except fossæ. Right fossa has tense fibrous bands running from the Eustachian eminence to the posterior pharyngeal wall. Left, small amount of glandular tissue. Tinnitus rushing in character, rising and falling with varying pitch and is continuous.

Result. — Tinnitus stops for long intervals and its character has changed to a humming sound. Hearing remains unchanged.

CASE VII. Mrs. H. M. Housewife. Irish-American. Hospital. Hearing, right 18-25 watch. Dench 80, otherwise normal. Left, 4-25 watch, Dench 80, otherwise normal.

Tinnitus, low rumbling constant but worse following colds. Right fossa, but little abnormal found. Left fossa, glandular tissue.

March 6. Tinnitus better but not wholly stopped.

CASE VIII. Mrs. A. K. Married. Twenty-nine years. Hebrew. Housewife. Hospital. Tinnitus both ears five months. Like engine. Intermittent. Hearing normal by test, but fluctuates, not being as good damp days. When tinnitus is present, she sometimes has frontal pains on bending forward. Left ear worse. O. M. Sec. C.

Examination. — Naso-pharynx normal except fossa. Left, distinct bands. Right, small amount glandular tissue.

Result. — Ceased to report for treatment.

May 20. C. S., single. Irish-American. Twelve years. State ward. R.—O. M. S. C., for two years. During this time he had been treated weekly at the hospital and twice daily at the home. His adenoids had been removed but the ear discharged continuously for two years. Both fossæ were filled with soft friable tissue which was removed and the discharge ceased in forty-eight hours.

CONCLUSIONS.

1. Pathological amounts of lymphoid tissue are present in Rosenmüller's fossæ in a large number of cases of chronic secretory and suppurative ears.

2. This cannot be detected with certainty by posterior rhinoscopy alone, even where a good view of the vault is obtainable.

3. In every chronic case there should be a routine digital examination.

4. Where much tissue has been found and removed, the process of healing should be watched that no fibrous bands form.

5. It is possible in a large majority of cases to predict the involved ear by the condition of the corresponding fossa.

6. Results, where after-treatment is followed, are particularly good in removing abnormal sensations, restoring uniform hearing without fluctuations in the partial or complete relief of tinnitus, and in the prevention of recurring salpingitis.

7. If directions are given to blow one side of the nose at a time and carefully, the affected tube is no more apt to be infected later than its fellow.

A PERIOSTEAL FLAP FOR USE IN PRIMARY AND RADICAL MASTOID OPERATIONS, WITH AN ILLUSTRATIVE CASE.*

BY GEORGE A. LELAND, M.D., BOSTON.

I SIMPLY want to show you one case: a woman, about twenty-five years of age, operated on a week ago for chronic inflammation of the middle ear and mastoid with caries. The patient's trouble began at seven years of age after measles and scarlet fever, both so near together as to practically be at one time. At nine years of age had discharge from left ear of uncertain duration. Five years ago she had discharge which lasted two months, and at that time there was some tenderness over the mastoid on pressure with very disturbing symptoms which, however, disappeared later. A week before she came into the hospital she had an earache with more or less absorption, shown by malaise, temperature, dizziness, headache and tenderness over the mastoid tip. The radical operation as usual was performed; the whole of the mastoid process being taken away (it was sclerotic in part) including the brittle tegmen antri. There was hardly any pus. The antrum and middle ear were more or less carious throughout.

The reason I bring forward this case is to show the results of a method I have been using for a couple of years to obliterate the posterior exenterated mastoid cavity, so that after the completion of the process the dermatized middle ear may be seen at the bottom of an external canal not much larger than before. The posterior cavity is a nuisance to a great many patients, depending, of course, on its size. Sometimes we have a very large cavity which one or more times a year, or oftener, has to be cleared out on account of the accumulation of cerumen and effete epithelial debris in this cicatricially dermatized cavity. Therefore, we have occasionally to perform more or less of a toilet to keep this cavity clean. Now, how can this be obviated?

Let me first recount the procedure in acute cases.

In ordinary mastoid operations for acute cases we clear out the cavity, pack it, and allow it to fill up. If in the healing we get a deposition of bone in the aditus then our mastoid cavity is shut off. If we have a deposition of new bone throughout the whole cavity we have no cavity to

be reinfected, therefore we do not get secondary mastoiditis. Probably many of us have had to do a mastoid operation over again, much to the disgust of the patient and others, including ourselves. The reason is, as you know, that if we get infection through the Eustachian tube into the middle ear and into the aditus, and our posterior cavity has not been filled up, we have the same liability to mastoid disease that we had in the first place. It has happened to me to have to do a secondary mastoid after a few months, and I had one such operation eleven years after the primary one was done, and within the last two weeks three or four such cases have come into my hands.

It has been interesting in these ante-mortem pathological examinations to see how much of bone was actually deposited in the mastoid cavity. Sometimes there is hardly any, but fibrous tissue lines the bony cavity enclosing, as in a capsule, a mass of old, pale, tough, loosely packed granulations, and then we have a real nice cavity for infection. Sometimes there is a greater deposit of new bone around the periphery of the cavity and a smaller mass of granulations, in the center of which a fistula leads down to bare bone near the aditus and so affords a good place for reinfection.

For several years I have been mulling over a method to prevent these secondary mastoids. I talked it over with several of the New York men and we agreed to try a piece of rubber tissue, first used by Dr. Abbe of New York (I think it was), in his operation for resection of branches of the fifth pair to prevent bridging over. I tried this in three or four cases to shut off the aditus, hoping almost against hope that it would remain, as of course the middle ear side of the rubber tissue was exposed to infection, whereas the posterior side, being covered by granulations, might be all right; but eventually this piece of rubber tissue made its way out.

About this time, I sought the aid of Dr. E. H. Nichols, our surgical pathologist, as to whether a piece of living tissue could be placed over the aditus and be made to grow there. The result of our conference was to try to obtain a large flap of periosteum with a broad base to insure its nourishment. For the last two or three years I have been using this flap. In the operation the usual curvilinear incision is made through the skin and the superficial muscles down to the fascia. Then the skin is dissected up from the fascia forward, till the depression is reached between the cartilaginous canal and the anterior mastoid wall; backward, it is then dissected upward for something like an inch and a half. With the posterior edge of the mastoid process as a guide an incision is then made down to the bone, from the tip upward and backward to the junction of the mastoid and occipital bones and then curved somewhat backward and then upward to the level of the linea temporalis; then forward on this ridge or a little above it upon the fascia, covering the lower edge of the temporal muscle. If the posterior edge of the mastoid process is strictly followed there will be almost no danger

* Read at a meeting of the New England Otolological and Laryngological Society, Nov. 15, 1907.