this is often the fault of the patient or of circumstances which put him out of reach of skilled attendance.

The reports received from 78 cases at periods of from a few months to thirty-five years from the beginning of symptoms are given below. Ages given always refer to the time of onset, unless otherwise stated:

	Under ten years.	Over ten years.	Total.
Well	3	6	9
Good condition	19	8	27
Fair	4	3	7
Poor	3	4	7
Dead	17	11	28
	46	32	78

The average time from beginning of the disease to the last report, for those under ten years, is three years; for those over ten years, a little more than four and a half years.

Of 10 cases where the abscess remained closed the statistics are:

	Condition at onset.	Present condition.
Well	0	0
Good	3	5
Poor	7	1
Dead	0	4
	10	10

Average duration of disease is nearly four years. One child and 3 adults have succumbed at periods of from four to six years. In 2 cases the abscess is reported to have disappeared.

Spontaneous opening took place in 12 cases. The statistics are:

	Condition at onset.	Present condition.
Well	0	3 (after six, ten and thirty-six years).
Good	1	5 (after two to six years).
Fair	6	1 (after eleven years).
Poor	5	1
Dead	0	2 (after two and four years).
	12	12

Average duration of disease slightly over six and a half years.

Of 8 cases treated by aspiration alone the statistics are:

	Condition at onset.	Present condition.
Well	0	2 (1 after eleven years).
Good	2	1 (after two years).
Fair	2	1 (after six years).
Poor	4	0
Dead	0	4 (3 after one, two and thirty-three years).
	8	8

Average duration of disease about eight years; average time elapsed since operation, three years and two months; out of 4 children 3 are dead.

Incision has been the method used in 48 cases; 32 under ten years and 16 over ten years. The statistics are:

Under Ten Years.		
	Condition at onset.	Present condition.
Well	0	1
Good	3	10
Fair	15	5
Poor	14	3
Dead	0	13
	32	32
Over Ten Years.		
	Condition at onset.	Present condition.
Well	0	2
Good	2	5
Fair	5	1
Poor	9	0
Dead	0	8
	16	16

Average duration of disease in cases commencing under ten years is about six years and ten months;

while of those commencing at beyond this period, four years and two months.

Average time elapsed since operation in the first class is five years and two months, and for the second about three and a half years.

SUMMARY.

Abscess.	No. Cases.	Recoveries.	Mortality.
Remaining closed	10	0	40 %
Spontaneous opening	12	3	16 2/3 "
Aspiration	8	2	50 "
Under ten years	32	1	40 "
Incision, over ten years	16	2	50 "

The prognosis of spinal caries with abscess, apart from the cases where the abscess opens spontaneously, seems to be very slightly influenced by the treatment accorded the abscess, although undoubtedly affected by the proper fixation of the spine.

Considering the series as a whole, we may say that the mortality is about 35% at an average period of three years and nine months after the first symptoms, and that the mortality is slightly greater among those in whom the disease commences before the tenth year.

Unfortunately the number of patients from whom reports have been received is not very large, but undoubtedly the spontaneous opening is the most favorable outcome. When the abscess remains closed, the mortality is almost as large as when treated by incision or aspiration.

There seems to be a decided danger of general tuberculous invasion in these cases, as 3 out of 4 deaths were caused by tubercular meningitis.

Causes of death.—In both children and adults the most common cause of death seems to be a gradual deterioration of whole system, as most reports say: "Failed gradually after leaving the hospital." The causes of death in a few cases where it was possible to get a reliable report are given below: General tuberculosis, 4; amyloid, 1; tubercular meningitis, 3; shock of operation, 2; sepsis and renal, 1; phthisis, 1.

In 2 other cases, both adults, tuberculosis has attacked the genito-urinary system, and 1 is now in the last stages of the disease.

In closing, I wish to thank the staff of the Children's Hospital and the staff of the Massachusetts General Hospital for allowing me the use of their records, and also many friends who have kindly furnished me cases from their private practice.

CELLULOID AS MATERIAL FOR FLAT-FOOT SUPPORTS.

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THE use of celluloid as material for flat-foot supports was first suggested, as far as the writer is aware, by Kirsch. By him, as well as by Schanz, in two subsequent publications, the advantages and disadvantages of its use were pointed out. Lightness, the absence of any tendency to corrode, cleanliness therefore, and the ease with which the plates can be made innocuous to foot wear have been considered its advantages; in addition to this a certain elasticity which is necessarily lacking in metal supports and which is said to contribute toward the comfort of the patient as well as the efficiency of the brace.

On the other hand it is acknowledged that celluloid plates are less durable than steel ones, that material of the very best quality must be obtained in order to obtain uniform results and that this is not always easy. It remained also to be proved whether or not celluloid plates possessed the rigidity requisite for their usefulness in the treatment of flat foot.

In undertaking to test the value of this material for the manufacture of flat-foot plates, the writer felt also the need of improvement in the process of working it. When placed in boiling water for a few minutes celluloid becomes quite soft and flaccid, but upon removing it from the water it rapidly stiffens, so that it cannot easily be manipulated with the hands. This, however, is the method recommended by Schanz in both of his communications on the subject.¹ After a few attempts made according to Schanz's directions, the writer abandoned the method of shaping the material freehand as being necessarily inaccurate and unsatisfactory. The procedure of Kirsch² seemed to promise more, involving, as it did, the use of the plaster cast and might be briefly described as follows: The corrected plaster cast is made in the usual way and having cut a piece of sheet celluloid to the desired shape, it is applied to the cast by means of a towel, the ends of which are twisted over the dorsal aspect of the cast, the middle being in contact with the sole. The twisted ends being held, the cast is now lowered into boiling water, and after a few seconds have elapsed the continued twisting of the towel ends is expected to bring the celluloid sufficiently into contact with the cast, and upon removing the whole from the boiling water and dipping it into cold for a few minutes the maximum stiffness is acquired.

After experiment with this method the writer finds that in addition to being quite troublesome the adaptation of the plate to the sole of the cast is far from being exact. In addition, however, it is believed that the use of the plaster cast in the usual manner can be improved upon both as regards accuracy and simplicity, as well in the case of metal as of celluloid, however, as material for the plate and in the treatment of flat foot.

It is assumed that it is the object of the flat-foot brace to support the depressed or weakened arch so much as is compatible with comfort, and therefore to the extent permitted by the flexibility of the foot. The flexibility of the foot, however, is a factor which will be found to vary within fairly wide limits, even in feet which are not the seat of the inflammatory stiffness so frequently present in flat foot. The amount of correction which must be made in the plaster cast is an uncertain thing and one which is really done by guess, so that it is believed to be a common experience that more or less change is required to be made in the finished plate in order to make it comfortable or efficient in the maximum, as the case may be. After considerable experiment with the following method, it is believed that it can be offered as being simpler, but also more exact than the use of a corrected plaster cast.

A pattern is first to be made which differs according to the type of support which it is desired to produce. This is made upon an impression of the sole of the foot according to the method of Schanz, except

that the writer believes the following method to be less objectionable than the use of soot or other black material, and that it furnishes at once a permanent record.

The impressions are taken upon pieces of cardboard obtained from the paper stockhouse under the trade name of "black showcard." A piece being cut of proper size, say $5\frac{1}{2} \times 12$ inches, it is fastened to a board of slightly larger size with drawing tacks, and its dull black surface is rapidly coated with a fairly thick solution of shellac in alcohol. In the meanwhile the patient has been rubbing his foot in a pan upon whose bottom ordinary talcum powder has been evenly sprinkled. The patient should bear his weight upon the foot and rub in the powder thoroughly by moving the foot about. When the spirit in the shellac has evaporated sufficiently to leave a sticky feel, but *without adhering to the finger*, the board is taken to the patient, from whose foot the excess of powder has been blown, and he is told to bear his weight upon it. While he is doing so the contour of the foot may be scratched in with a suitable sharp instrument. It is well now to draw in with white ink the outline of the impression as well as the contour of the foot. The result is shown in the figure. By interposing tissue

FIG. 1.

paper between each pair of impressions, they may be conveniently and indefinitely preserved.

To make the pattern, a piece of tissue paper is placed upon the impression, and the pattern may now be drawn with the outline of the impression and the contour of the foot in plain view. The paper is now cut out, and from this paper pattern another is cut in sheet lead about $\frac{1}{8}$ inch in thickness (known as 4-pound lead). This lead pattern is now hammered by rough guess into the shape of the future support, a horn hammer or the handle of a file being used for this purpose. Due regard must be had for the "balance" of the support while so doing. The hammering of the sole has a tendency to make the whole piece curl, and it is well from time to time to press that which is to come in contact with the sole of the shoe against a plane surface so as to be able to properly estimate the amount of arch which is being given.

This having been done, the pattern is fitted to the patient's foot and with a very little practice one is able to obtain a perfect fit with a few taps of the hammer. The patient can assist one by telling whether there is too much pressure in one spot or whether the whole pressure is disagreeable. It will

¹ Schanz: Zeitschr. f. orth. Chir., Bd. vi, S. 495; Schanz u. Mayer: Zeitschr. f. orth. Chir., Bd. viii, S. 25.
² Kirsch: Centrbl. f. Chir. 1896, S. 837.

be found best not to attempt altering the lead pattern with the finger, but always with the hammer, not forgetting the "balance" each time that it is so changed. This pattern when so fitted is intended to serve as a form on which to mould the celluloid, or in case a metal support is to be made, the pattern instead of the foot is used to make the cast upon which the workman fits the brace.

In working with celluloid the material is first cut out in proper shape, a scroll saw being best adapted for this purpose. It is well now also to finish the edges of the celluloid. Celluloid or rubber scrapers made for the use of dentists will be found well adapted for rounding the edges and they can then be made smooth with fine sandpaper.

The celluloid is now superimposed upon the lead pattern, which must be handled with some care, for while it withstands the pressure which is necessary, it can, nevertheless, be easily bent by striking the floor or any hard object with force. The celluloid is fastened to the lead pattern with clips or with rubber bands, and it is necessary to see that now and afterward during the shaping process the outer edges of celluloid and lead coincide.

By means of forceps with smooth jaws, plate and pattern thus clamped together are now lowered into boiling water, which must be of sufficient depth to

FIG. 2.

cover them; a granite-ware baking dish will be found a convenient vessel. As soon as the celluloid has begun to soften it should be gently pressed down to the pattern and when thoroughly flaccid the whole is removed from the vessel with the forceps by one hand and received by the other hand, which is protected from the heat by a towel folded several times. The celluloid, still kept hot by the lead underneath, is now made to fit the pattern accurately. This can be done quickly and with ease. The whole is now immersed in cold water for a few minutes and is then ready to apply to the patient. The plate may be given a finish by rubbing the whole of it with fine sandpaper.

Good celluloid is a material of great toughness and if sufficient force is used can be bent to a certain extent without heating. If any further adjustment of the edges is required, to prevent injury to the shoes, for instance, this can be quickly accomplished by using the forceps before mentioned, whose jaws are smooth and which is considerably bent on the flat. If it is desired to make a plate with an external flange, the pattern having been shaped accordingly, this must first be shaped frechand so that when the celluloid is placed upon the lead, the flange as well as the outer edges of the plate and pattern, respectively, may coincide. Figure II shows a plate made in this way.

The material which has been used in these experi-

ments is known by the trade name of "pyralin"⁸ and has been found of uniform quality. Three thicknesses have been used, $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ inch. The thickness to be used depends upon the weight of the patient and in scarcely less degree upon the flatness of the arch as shown by the impression. Material of $\frac{1}{16}$ inch is used as a rule for children only and for persons weighing less than 100 pounds.

The writer feels that he must speak with some reserve with regard to the durability of these plates, for he has been using them not quite six months. But one of the plates has been broken; this was in the case of a very active young man with perfectly flat feet and weighing about 150 pounds; the break occurred in jumping from a street car and the material was $\frac{1}{16}$ inch. The rigidity of the plate has been well tested in one patient of 172 pounds, who has been wearing it for five months. Although of $\frac{1}{16}$ inch thickness, the plate shows no appreciable change upon comparison with the pattern from which it was made. However, if such yielding occurred it could be easily remedied by reshaping it in the boiling water with the original lead pattern.

Absolute accuracy cannot be claimed for the above method, especially when celluloid is used, for it is the under surface of the celluloid which is shaped to the pattern instead of the upper, and the inaccuracy will be in direct ratio to the thickness of the material. In practice this has been found unimportant, however. In addition it does not appear that such a degree of accuracy has been reached in the treatment of flat foot as to constitute a serious objection. When the lead pattern is used to obtain the plaster cast in the manufacture of metal supports, the inaccuracy is, of course, much less.

[NOTE. — Since writing the above there has come to the author's notice an article by Mökmöller and Kafan in the *Neurolog. Centrbl.* of September 21, 1900. This has suggested a simpler and equally efficacious method of taking impressions of the feet. The following method has been found satisfactory: With a cotton swab the sole of the foot is moistened with a solution of tincture of iron and 70% alcohol, each 45; glycerine 10. Care should be taken in order that the entire weight-bearing part of the foot may be covered with solution; if the latter is used too profusely the impression will not be clear. The patient now steps upon a piece of white cardboard for about two seconds. The image is now developed by lightly painting the card with a strong solution of tannin in 70% alcohol. Mökmöller and Kafan use ammonium sulphocyanate in ethereal solution for developing.]

THE AGGLUTINATION BY THE PATIENT'S SERUM OF THE BACTERIA FOUND IN CYSTITIS AND PYELITIS, WITH A CONSIDERATION OF THE PLEOMORPHISM OF THE BACTERIA FOUND IN THESE INFECTIONS, ESPECIALLY AS REGARDS CHROMOGENIC PROPERTIES OF THE STAPHYLOCOCCI.

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SINCE the demonstration of the agglutination reaction by Widal in the case of the typhoid bacillus, numerous contributions have been made which describe similar instances of agglutination in the case of other micro-organisms. Thus, besides the enormous amount of work that has been done in this connection with typhoid, considerable attention has been paid to the diagnosis of Malta fever and of tuberculosis by similar means, while numerous isolated observations have

⁸ Obtained from the Arlington Company, 475 Broadway, New York.