significance that neither of these appearances was influenced in any way by the dionine application.

The application of adrenalin has not been observed to cause any change in the perivascular lymph spaces.

Variations in the intensity of the dionine reactions are interesting. We found it particularly strong in children, weaker in older people, and in arterio-sclerotic subjects. An arterio-sclerotic man with glaucoma simplex was especially refractory. Alajmo found the conjunctival oedema especially pronounced in scrophulous children. It may be that a scale of vascular function might be established on the intensity of the dionine effect.

The rabbit's conjunctiva is not responsive. Even a 5 per cent. solution of dionine does not produce chemosis, but this does not prove that dionine has no effect on the rabbit's eye. Loewenstein and Kubik (1915) found that the application of dionine powder to the rabbit's conjunctiva caused a rise (slight, but beyond the limits of error) in the refractive index of the aqueous humour.

Summary

1. Perivascular lymph vessels are commonly observed in cases of subconjunctival haemorrhage four or five days after its occurrence. They can be seen to accompany conjunctival vessels which cross the haemorrhagic area. An optical explanation is offered.

2. They disappear in from 40 to 60 seconds after instillation of dionine solution, concurrently with the onset of conjunctival oedema, and reappear in from 30 to 60 minutes as the oedema passes off.

3. The oedematous fluid in the conjunctiva, at first clear, becomes milky after 15 to 30 minutes.

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BURIED SILK, CATGUT AND STRABISMUS SUTURES*

BY

JOHN FOSTER

LEEDS

IN view of the terminal remarks in the annotation in May, 1944, p. 249, I thought that the following clinical and experimental findings might be of interest.

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Having used both silk and catgut for buried strabismus sutures, I have not noticed much difference either in the reaction, or the firmness of the junction so produced.

Single recessions can return home in a week as a rule, while Dunnington[1] using 0000 10-day chromic catgut even sends patients home in 48-72 hours.

When reaction has been marked, there has usually been collateral evidence of infection, haematoma, or high muscular tension, produced by a large resection.

Whether silk or catgut is employed, a certain amount of stretching appears to take place in a few cases in the first few weeks after operation, and some orthoptists are most anxious to restart as soon as possible after any operation ending in an under-correction.

Chromicised 30-day 6/0 (000) catgut mersutures were employed exclusively in the cases recorded in my paper[2], as in general I was following the technique of Jameson[3]. In addition to this, when used as a conjunctival suture, catgut absorbs spontaneously, and need neither be removed therefrom in children, nor from the deeper layers if infection occurs.

Much greater care is needed in procuring apposition of the conjunctival edges, to avoid granulations, than when 00 black silk is employed.

Strength of Sutures

In 1939 I noticed (when writing the paper quoted above), that No. 2 white silk (the usual squint advancement suture) seemed unnecessarily thick and strong, and that on one or two occasions twice-boiled black 00 silk disintegrated almost spontaneously. I therefore asked Professor Speakman of the Textile Department of Leeds University to determine the tensile strength of various forms of ophthalmic silk in current use, to ascertain the effects of different methods of sterilisation, and of dyeing upon it[4].

His figures for the "straight-pull" breaking load, are given in Table I. These show that the length of sterilisation up to six minutes has little effect on silk, but that silk sterilised in 2 per cent. sodium bicarbonate solution is only 97·7 per cent. as strong as when sterilised in distilled water.

Black threads, on the whole, are weaker than white of the same diameter. This finding is true of all dyes, though some are worse than others. It is interesting to note that English ophthalmic silk is no longer "iron dyed" (Logwood with an iron mordant) as stated on the packet. Since 1935 sometimes sulphur black has been found more satisfactory.

If the gauges are comparable with Localio's[7] figures, then it would seem that cotton is stronger than ophthalmic silk of the same diameter.

TABLE I

Strength Tests of Silk Threads: Tested 9 inches between jaws

Sample No.	Unboiled	Boiled in Distilled Water		Average	Boiled in 2 per cent. Soda Bicarbonate Solution		Average
		3 minutes	6 minutes		3 minutes	6 minutes	
Black 00 (twisted)	21·5 oz.	19·5 oz.	19·5 oz.	19·5 oz.	20·0 oz.	—	20·0 oz.
Black 0 (twisted)...	29·0 oz.	28·5 oz.	28·0 oz.	28·25 oz.	28·0 oz.	26·5 oz.	27·25 oz.
Black 1 (braided)	47·0 oz.	47·0 oz.	45·5 oz.	46·25 oz.	44·5 oz.	45·0 oz.	44·75 oz.
Black 2 (braided)	no test	112·0 oz.	113·6 oz.	112·8 oz.	113·6 oz.	100·0 oz.	106·8 oz.
White 00 (twisted)	28·0 oz.	28·0 oz.	26·5 oz.	27·25 oz.	26·0 oz.	26·5 oz.	26·25 oz.
White 0 (twisted)...	39·0 oz.	41·0 oz.	38·0 oz.	39·5 oz.	39·0 oz.	37·0 oz.	38·0 oz.
White 1 (braided)	44·0 oz.	45·0 oz.	44·0 oz.	44·5 oz.	44·5 oz.	43·5 oz.	44·0 oz.
White 2 (braided)	80·0 oz.	83·2 oz.	80·0 oz.	81·6 oz.	80·0 oz.	83·2 oz.	81·6 oz.
		ELONGATION TESTS					
Black 00	2·19 in.	2·69 in.	2·69 in.	2·69 in.	2·19 in.	—	2·19 in.
Black 0	2·44 in.	2·44 in.	2·44 in.	2·44 in.	2·38 in.	2·25 in.	2·315 in.
Black 1	2·56 in.	2·94 in.	2·53 in.	2·785 in.	2·63 in.	2·75 in.	2·69 in.
Black 2	—	2·70 in.	2·70 in.	2·70 in.	2·90 in.	2·70 in.	2·80 in.
White 00	2·19 in.	2·38 in.	2·06 in.	2·07 in.	2·25 in.	2·31 in.	2·28 in.
White 0	2·19 in.	2·69 in.	2·50 in.	2·595 in.	2·69 in.	2·56 in.	2·625 in.
White 1	2·25 in.	2·88 in.	2·50 in.	2·69 in.	2·75 in.	2·56 in.	2·655 in.
White 2	2·70 in.	2·50 in.	2·30 in.	2·40 in.	2·60 in.	2·38 in.	2·49 in.

I found, on an average[2] that a scleral 000 catgut suture takes a pull of about 500 grams. (*i.e.* 17 oz.) to tear it out when inserted for purposes of recession, or resection, while the same suture in muscle takes rather less—about 350 grams. (12 oz.).

Lancaster[5] claims that the maximum pull which can be developed (although seldom, if ever exerted) by any eye muscle is about 1000 grams. (34 oz.). I would suggest, therefore, that the minimum safe

tensile strength for a suture at the time of insertion is probably about 30 oz.

In addition to the tension in the wound itself, it is common experience that if sutures actually break, they do so as a rule while they are being knotted. It is interesting, therefore, to note that the "knot break" strength, given in Table II by Speakman, is only about half that of a straight yarn.

Taking the above figures into consideration and allowing for the considerable variation in the strength of all threads when tested by different observers, and the same observer using different specimens, No. 2 white braided silk and even 000 catgut are probably initially unnecessarily strong, and No. 0 white (twisted) silk not reliable enough for deep strabismus suturing (Table III). It

TABLE II

Silk (Boiled Ophthalmic)	Breaking Load (oz.)	
	Straight Break	Knot Break
No. 2 White ...	81·8	52·1
No. 1 White ...	42·8	32·6
No. 0 White ...	19·2	16·4
No. 2 Black ...	104·5	62·8
No. 0 Black ...	20·4	17·1
No. 00 Black ...	20·2	12·3

TABLE III

Material	Tester	Breaking Load (oz.)	
		Straight Break	Knot Break
White Silk, No. 2 (Braided) ...	Speakman	81·8	52·1
Catgut 000	Mead and Ochsner	58	—
Cutgut 000	Localio	48	32
Catgut 000 (Mersuture)	Speakman A	76	41
Catgut 000 (Mersuture)	Speakman B	97	39
Cotton 00	Localio	43	—
White Silk (Braided), No. 1	Speakman	42·9	32·6
Cotton 000	Localio	40	—
White Silk (Twisted) No. 0	Speakman A	39	—
Catgut 0000	Localio	32	16
White Silk (Twisted) No. 0	Speakman B	19·2	16·4

A and B represent different specimens of the same material.

must not be forgotten, of course, that catgut diminishes in strength in the wound, and therefore a margin must be allowed for depreciation.

I have no experience of the use of cotton thread, the figures being inserted for comparison only.

All of us have been annoyed by silk threads pulling out of the eye of a needle during interrupted suturing. The plastic surgeons knot the silk just behind the needle to counter this. The knot catches too much on the conjunctiva or cornea for ophthalmic use, and I would like to draw attention to the ingenious method of pushing the needle through the silk behind the eye of the needle, described by Meyer and Wiener, at the beginning of their textbook[8]. I have found this method most practical, and in conversation that colleagues who have read the book, have completely overlooked the first few pages.

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PHOTOMETER FOR MEASURING THE SCOTOPIC CANDLEPOWERS OF SELF-LUMINOUS OPHTHALMIC TEST OBJECTS

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Abstract

A PHOTOMETER is described with which the scotopic candlepowers of very feeble light sources (down to about 10^{-9} candle) can be measured. Small spots of radium paint, 2 or 3 mm. in diameter and having candlepowers in the range covered, are now used (Livingston) to plot the dark-adapted visual field, and the present photometer was designed primarily for their calibration. The radium paint emits green light but the instrument can be used for