amount of antigen on the cell's surface, or by the collodion-particle technique where this prospect could be more easily realized. We have carried out such an experiment with the agglutinating system "blocking" anti-D-trypsinized cells. A preliminary note on this subject will be published (Hubinont, 1951).

I wish to express my gratitude to Dr. R. R. A. Coombs and Dr. J. J. Van Loghem, jun., for their kind and comprehensive criticisms, and to Miss Helene Holt for advice in the writing of this paper.

REFERENCES

- Bawden, F. C., and Kleczkowski, A. (1942). *Brit. J. exp. Path.*, **23**, 169.
 Dean, H. R., and Webb, R. A. (1926). *J. Path. Bact.*, **29**, 473.
 Hubinont, P. O. (1948). *C.R. Soc. Biol., Paris*, **142**, 1458.
 — (1951). *Nature, Lond.* (to be published).
 — and Massart-Guiot, T. (1950). *Rev. Hémat.*, **5**, 340.
 Levine, P., and Walker, R. K. (1946). *Science*, **103**, 389.
 Millet, M., and Hubinont, P. O. (1946). *C.R. Soc. Biol., Paris*, **140**, 1227.
 Proom, H. (1943). *J. Path. Bact.*, **55**, 149.
 Ramon, G. (1922). *C.R. Soc. Biol., Paris*, **86**, 661.
 Shibley, G. S. (1929). *J. exp. Med.*, **50**, 825.
 Van Loghem, J. J., et al. (1950). *Maandschr. Kindergeneesk.*, **18**, 115.
 Wiener, A. S. (1944). *Proc. Soc. exp. Biol., N.Y.*, **56**, 173.

THE INJECTION TREATMENT OF HYDROCELES AND SPERMATOCELES

BY

J. A. RHIND, F.R.C.S.

(From the General Infirmary at Leeds)

Despite the antiquity of injection treatment of hydroceles and spermatoceles there is still no general agreement regarding its value. The diversity of injection material is perhaps an indication that none is entirely successful, reflecting the multitude of operating techniques. The surgeon who promises a patient a brief stay in hospital, early return to work, and freedom from recurrence has either a short memory or little experience. It is felt that, if injection therapy has anything to offer, there is a place for it in the treatment of hydroceles and spermatoceles. It has been used sporadically in this hospital over a number of years, but unfortunately the records do not permit investigation of out-patients treated before 1948, when a new system of documentation was introduced. A fresh wave of enthusiasm for injection began in March, 1948, and it is the effect of this wave that I have attempted to discover.

Cases

The distribution of the cases is shown in Table I. The hydrocele clinic was a special clinic held on Saturday mornings for the repeated aspiration of hydroceles and spermatoceles. One patient had been attending for 40 years, several for more than 10 years; the average was about 5 years. The cases have been divided into frequent (average interval of three to four months between aspirations) and infrequent attenders (interval greater than a year). Each patient who attended the hydrocele clinic was injected at his first visit after March, 1948. Patients attending the hospital for the first time were seen by either a consultant surgeon or the R.S.O. acting as his deputy. All patients seen by the R.S.O. were referred to the hydrocele clinic for trial of injection

TABLE I.—Number of Lesions

	Total No.	Operation Advised	No Treatment	Aspiration	Aspiration + Injection
Hydrocele clinic	66	1	—	5	60
New patients:					
1948 { Hydrocele ..	61	23	4	2	32
{ Spermatocele ..	29	12	2	1	14
1949 { Hydrocele ..	53	21	1	8	23
{ Spermatocele ..	28	9	2	1	16

Eight patients had bilateral lesions. Many of the patients for whom operation was suggested had an associated lesion (e.g., hernia) for which operation was advisable.

before consideration of operative treatment. Of the patients seen by consultants, some were advised operation, some were reassured that no treatment was necessary, and others were referred to the hydrocele clinic; a few were treated by immediate aspiration (see Table I). To this extent the material is selected, probably accounting for the small proportion of young patients in the series. Many of these patients had been treated by their own doctors for some time, being referred to hospital either because of the increased pressure of work with the advent of the National Health Service or because they expressed a wish for operative treatment, being tired of repeated aspiration.

The distinction between a hydrocele and a spermatocele, while usually simple, is not always made, and in several cases it has been difficult to decide from the documents whether "hydrocele" meant in fact a hydrocele of the tunica vaginalis, or whether it was being used as a generic term for a fluid swelling in the scrotum. When the fluid has been aspirated several times it is often very difficult to be sure of the diagnosis; no attempt has therefore been made to classify the hydrocele cases attending the clinic as old patients.

Technique

A few patients were injected with "ethamolin"; this treatment was stopped when it was discovered that severe pain occurred, followed by collapse, the patient becoming cold, with a thready pulse. All cases recovered after resting for a few hours. I have not seen this collapse after injecting ethamolin into varicose veins, and do not think the reaction can be anaphylactic in nature. In one case procaine was injected after emptying the sac, five minutes before the ethamolin; the patient did not complain of pain and showed no untoward reaction—this supports the suggestion that the collapse is neurogenic—but he collapsed in the tram on his way home, and was confined to bed for two weeks with a red, painful, swollen scrotum, which subsided without discharge. This treatment seemed to be too drastic, and was abandoned, although the patient, who had been attending for aspiration of a spermatocele every two months, stated at a review two years later that "it was worth it," for there had been no return of fluid. It has not been possible to trace the records of the other patients who were treated in 1947; they have not attended hospital since, and so have not been included in the present series.

Quinine-urethane has been used since March, 1948. It has been prepared in the hospital dispensary, the following being the prescription:

Quinine hydrochloride	4 g.
Urethane	2 g.
Distilled water	to 30 ml.

The hydrocele sac is emptied as completely as possible, using a trocar and cannula, and 4 ml. of quinine-urethane is injected through the cannula. For a small spermatocele

a large-bore needle and syringe is easier to use. A multi-locular collection of fluid presents difficulty; usually the whole injection was given into the largest loculus, but sometimes it was divided between two large loculi. Pain is unusual, and many patients were unaware that an injection had been given. At first each patient was asked to attend again after a fortnight. Almost invariably there had been rapid reaccumulation of fluid: in some cases this was simply aspirated; in others a second injection was given. Later, patients were just asked to return as usual—"when the fluid comes back"—and were injected again on their return; this is the technique that we favour at present. After the injection there is a rapid effusion into the sac; in a favourable case this reaches a maximum after about two weeks, then is gradually absorbed in the course of about two months.

Most cases were treated by students under supervision, and some by house-surgeons unfamiliar with the exact technique; this accounts for a certain variation in the details of treatment. A technical point worthy of note is that in the cold the quinine tends to crystallize from the solution. These crystals, which are easily seen if the bottle is examined, dissolve readily on warming. If attention is not paid to this detail the concentration of quinine in the injection may be low.

Review

Most of the patients were seen personally during April and May, 1950. It is surprising how large a collection of fluid may pass unnoticed by a patient who has had a hydrocele for years; many of those who were classified as only improved, and some of the failures, expressed the opinion that they had been completely cured by the treatment. In only a few cases, therefore, was a letter from the patient regarded as sufficient. Five of the patients died, and one spermatocele was excised during operation for an inguinal hernia before the effect of the injection could be seen. In two cases it was felt to be too early to make even a guess at the effect of the injection. Most of the remaining missing patients had changed their address and could not be traced. It is thought that the 128 lesions reviewed represent a fair sample of the whole; they have not been subject to selection in any way.

Results

The results are shown in Table II. The effect of treatment was considered to be satisfactory if there was a complete absence of fluid, or less than 2 oz. (57 ml.)

TABLE II.—Results of Treatment

	Total No.	No. Reviewed	Satisfactory	Improved	Failure
Hydrocele clinic:					
Frequent tapping ..	46	41	31	9	1
Infrequent tapping ..	14	13	5	5	3
1948 { Hydrocele ..	32	26	16	4	6
Spermatocele ..	14	11	6	4	1
1949 { Hydrocele ..	23	22	15	2	5
Spermatocele ..	16	15	9	2	4
	145	128	82	26	20

The numbers refer to lesions, not patients. The results on the two sides were not always the same.

without any suggestion of a gradual increase. In many cases there was a very small amount of fluid which could be manipulated into any part of the tunica vaginalis; this is not in keeping with the theory that obliteration of the tunica vaginalis is produced by injection therapy.

In others there was a small amount of fluid at the upper pole of the testis. Whether this represented a localized collection of fluid in the tunica vaginalis or a true spermatocele is difficult to say, but the presence of a similar swelling on the opposite side in many cases suggested that the latter explanation was the correct one. After injection of a spermatocele it was common to find a firm nodule the size of a pea in the epididymis. An improvement was considered to have taken place if the interval between aspirations was appreciably lengthened or if the hydrocele content was much smaller than before treatment and was not increasing.

Before this review was undertaken it was known that some cases had derived great benefit and that others must be classified as failures. It was hoped that a survey of the series might provide some basis for predicting the effect of injection therapy. However, analysis of the cases by age, size of hydrocele, length of history, and detailed technique of treatment does not reveal any marked difference in results. On the whole, cases requiring frequent aspiration responded better than those whose fluid accumulated only slowly, but there were many exceptions to this. I believe that the method is worthy of trial in any type of case.

Complications

Pain severe enough to be recorded or remembered occurred in nine cases. One patient was off work for three days, another for one day. The remainder did not stay away from work, but it must be remembered that most of the injections were given on Saturdays.

Inflammation.—In another case pain after injection was accompanied by redness and swelling of the scrotum, with a pyrexia of 102° F. (38.9° C.), confining the patient to bed for two days. The reaction settled without discharge and there has been no return of fluid. While this reaction may have been a chemical inflammation in a patient with an idiosyncrasy to the material injected, bacterial contamination was perhaps more likely.

Haemorrhage.—In several hydroceles tapped two weeks after injection the fluid was brown, owing to the presence of altered blood. In two cases bleeding was sufficient to produce a clotted haematocoele, resistant to aspiration: one of these cases became infected and was drained two months after injection; the other refused operative treatment, and the haematocoele was unchanged at review fourteen months later. Haemorrhage is not an uncommon complication of tapping alone, and it is not certain that the injection can be held to blame for this incident. During 1948 two patients were admitted to this hospital as emergencies, with haematocoeles following aspiration by their own doctors.

Illustrative Cases

Case 1.—Aged 72. Attended the hydrocele clinic for 40 years, having 15 oz. (425 ml.) of fluid aspirated every three months. On April 10, 1948, 4 ml. of quinine-urethane was injected. On April 24 7 oz. (200 ml.) of fluid was aspirated and a further injection of 4 ml. given. At a review on April 19, 1950, there was no fluid in the scrotum.

Case 2.—Aged 78. Attended the hydrocele clinic for 16 years, having 10 oz. (284 ml.) of fluid aspirated every six months. A single injection of quinine-urethane was given on April 17, 1948. At a review on April 19, 1950, there was a small hydrocele containing about 2 oz. (57 ml.) of fluid.

Case 3.—Aged 61. Attended the hydrocele clinic for four years, having 10–16 oz. (284–454 ml.) of fluid aspirated every two to three months. The first injection of quinine-urethane was given on June 12, 1948. On December 4, 1948, 13 oz. (368 ml.) of fluid was aspirated and injection repeated. At review on April 12, 1950, there was no fluid in the scrotum.

Case 4.—Aged 69. Attended the hydrocele clinic for 18 years, having 10 oz. of fluid aspirated every four months. Injected on April 3, 1948. There was a sudden recurrence of fluid during February, 1950; injection was repeated. This case is classified as "improved."

Case 5.—Aged 62. First attended with hydrocele on April 3, 1948, when 30 oz. (850 ml.) of fluid was removed and 4 ml. of quinine-urethane injected. On May 3, 1950, he had a spermatocele containing about 1 oz. (28 ml.) of fluid.

Case 6.—Aged 57. Attended with a spermatocele from which his own doctor had removed 2 pints (1.14 litres) of fluid in September, 1947. On March 19, 1948, 2 pints of clear fluid was withdrawn, and 15 ml. of quinine-urethane injected by a house-surgeon; the patient remembers no reaction. On June 21, 1950, he had bilateral small spermatoceles, none bigger than a pea.

Case 7.—Aged 42. Hydrocele for one year; no previous treatment. On January 31, 1949, 60 oz. (1.7 litres) of fluid was removed and 4 ml. of quinine-urethane injected; on February 12, 13 oz. was removed and injection repeated; on February 26, 10 oz. was removed and injection repeated; and on March 12, 4 oz. of fluid was removed. On May 24, 1950, there was no fluid in the scrotum, but some thickening of epididymis.

The cases under review include three "hydroceles" which recurred after operation. It was also revealed that six patients had had previous injections: one as early as 1930, when 1.5 ml. of quinine-urethane was injected without improvement; another in 1933, when 2 ml. of quinine-urethane produced no effect; neither of these patients attended again after two injections of quinine-urethane in 1948, and unfortunately they are not available for review, one having died and the other having left the area. Another patient, injected in 1940 (injection fluid not specified), remained free from fluid until 1948; this illustrates the difficulty in determining the value of injection treatment, but perhaps few patients would undergo operative treatment to avoid injections every eight years.

Discussion

Review of the literature is rather disappointing. Many patients with hydroceles are old and have a short expectation of life, and not all hydroceles refill rapidly after simple tapping. It is expected, therefore, that, as in this series, a certain number of the patients in an unselected series will die before the effect of the injection can be judged, and any series that claims 100% cure may be regarded with suspicion. James (1941), reporting a case of "giant" hydrocele—64 oz. (1.8 kg.)—treated by injection of "lithocaine" followed by quinine-urethane, mentioned that he had had complete success in every one of his series of 74 cases. Diamond (1942) claims the cure of 76 cases, using a single twin injection of lithocaine and quinine-urethane, the patient remaining in bed for two to three days until comfortable. Cases coming to necropsy four to five years after injection showed complete obliteration of the tunica vaginalis by soft elastic fibrous tissue. He admits no failures, but does not mention the length of observation. Foote (1945) recommends the injection of procaine before quinine-

urethane and lithocaine to prevent pain, not mentioned by James; he advises quinine-urethane for routine use, lithocaine being employed for failures or recurrences, but does not give any results. Ewell *et al.* (1940) and Bruskewitz and Ewell (1948) advocate the use of quinine-urethane, 1–2 ml. weekly for three injections, repeated later if necessary; one patient received 17 injections. They had seven failures or recurrences in 165 cases, but it is disturbing to read that one patient was operated on a month after "cure" by these injections—surely a premature assessment of the result.

When injection treatment was reintroduced at the hydrocele clinic, one of the prime considerations was that it should entail little inconvenience to the patients, most of whom were old. Many of them accepted as a condition of old age the fact that they had to attend every three months for tapping, and it was interesting to see what improvement could be produced without increasing the burden of treatment to which they were resigned. As stated above, many did not notice any departure from the normal routine of tapping, and were surprised that the fluid did not return. The period of observation is short; some of the "satisfactory" cases may disappoint by recurrence; and perhaps more of the failures may show response to later injections. It would be interesting to know how many would respond to other types of injection; but, despite the opinion of the patient treated with ethamolin preceded by procaine, it is thought that most patients would rather attend regularly for tapping than spend a few days in bed with a painful scrotum.

Summary

Most of the 145 hydroceles and spermatoceles treated by the injection of quinine-urethane since March, 1948, received only one injection. Pain was reported in less than 10%, and other complications were rare.

Of 128 lesions reviewed, 82 were considered satisfactory in that they were either free from fluid or contained a small quantity which could be detected only by careful examination. Twenty cases were assessed as failures.

Cases requiring frequent tapping responded better than those whose fluid accumulated only slowly.

Review of the literature suggests that better results may be obtained by the additional injection of lithocaine, but it is doubtful whether the increased disturbance justifies its use in the majority of patients.

My thanks are due to all the consultant surgeons of the General Infirmary at Leeds for permission to treat and review their cases, and to many students and house-surgeons, notably Mr. J. F. Scarlett and Miss Diana Elkington, for assistance.

REFERENCES

- Bruskewitz, H., and Ewell, H. (1948). *J. Urol.*, **59**, 67.
- Diamond, J. C. (1942). *Amer. J. Surg.*, **55**, 121.
- Ewell, G. H., *et al.* (1940). *J. Urol.*, **44**, 741.
- Foote, R. R. (1945). *Postgrad. med. J.*, **21**, 133.
- James, W. L. (1941). *British Medical Journal*, **2**, 693.

A medical teaching mission, composed of 14 specialists from six different countries, is now visiting Israel. Clinical and other specialists of the mission will spend one month in Israel, after which they will go to Persia for three weeks. The public health unit of the mission, directed by Dr. Karl Evang, of Norway, a former president of the World Health Assembly, will remain in Israel for two months. Mission members will work with specialists in their own fields, give lectures and demonstrations, visit hospitals and medical schools, exchange information, and attend conferences.