Removal of Rust Rings, Comparing Electric Drill and Hypodermic Needle

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Corneal rust rings are a common problem presenting in most casualty departments.¹ They are caused by an iron foreign body, embedded in the cornea, which undergoes partial disintegration with the result that iron is deposited in the stroma. It is generally agreed that the ring should be removed to prevent the continuation of ocular inflammation and delayed healing.²

Various methods have and are being used to remove rust rings (Table I). Various types of spuds and needles have been described,³ however the most common, sharp pointed instrument used as a hypodermic needle, attached either to a syringe or a special handle.⁴ Desfer-

rioxamine is a chelating agent, which combines with the iron ion, but its use has been shown to be less effective, than manual removal.⁵ The use of a manual drill was advocated by Grossman in 1950.⁶ Electric drills usually rotate dental burs, and various models have been described.^{7,8}

Our aim was to compare removal of rust rings with either an electric drill or a hypodermic needle.

Materials and Methods

A total of 60 patients referred to Ninewells Hospital with corneal rust rings were included in this study. In 9 patients, where the foreign body was still present on arrival, it was removed with a 25 gauge needle.

The patients were randomly divided into 2 groups, 30 patients in each. In one group the corneal rust ring was removed with a 25 gauge needle attached to 1 ml syringe (Fig. 1). In the other group the corneal rust rings were removed with an electric drill (burr sizes 0.3-0.5 mm) (Fig. 2).

Before removal the visual acuity was noted, the size of the rust ring was measured and the position assessed as the shortest distance from limbus. The cornea was anaesthetised with 2 drops of Amethocaine Hydrochloride (1 per cent). The rust rings were removed by two of the authors (HS, IH) under slitlamp illumination. The time taken for removal of the ring was recorded for each patient.

After the procedure each patient was assessed for

- (a) the ease of rust ring removal;
- (b) patient's discomfort during removal;
- (c) patient's co-operation during removal.

For each of these factors a Grade 1-3 was given, Grade 2 average, Grade 1 an easy removal, no discomfort and good co-operation, Grade 3 diffi-

Table I *Methods for removal of rust rings*

1. Sharp pointed instruments
2. Desferrioxamine
3. Drills

Table II *Comparison of treatment groups*

	Needle	Drill
Needle patients	30	30
Average age (years)	30	35
Foreign body present (patients)	6	3
Size rust ring (mm)	0.2	0.2
Site from limbus (mm)	3.0	2.6

Table III *Removal time for each treatment*

	Needle	Drill
Time for removal (seconds)	129.3	47.2
Standard deviation (seconds)	74.8	26.9

$p < 0.0001$.

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Fig. 1. 25 gauge needle attached to 1 ml. syringe.

cult removal, discomfort or no co-operation from the patient. Each patient was given Oc. Chloromycetin and a double pad on the eye and advised to attend the Out-Patient Department 2 days later. Forty-two patients returned, visual acuity and epithelial healing were assessed, 2 patients, one from each group had a little rust left and discomfort associated with it, and a further removal was therefore undertaken.

Results

All the patients except one were males; they

Fig. 3. Scatter plot comparing drill and needle group.

Fig. 2. An electric drill with burrs.

were first seen on average 3 days after the injury. Table II shows that the size of the rust ring and site from limbus was similar in both treatment groups. Table III shows the time taken to remove the rust rings. For the needle group the mean treatment time was 129.1 sec, while for the drill group it was 47.1 sec. The scatter plot in Figure 3 emphasises the low standard deviation in the drill group. The difference between the 2 groups is statistically significant, $p < 0.0001$. Table IV and VI show

Table IV Subjective assessment by the surgeon: Ease of removal

Grading	Needle		Drill	
	No. pat.	(%)	No. pat.	(%)
1	7	(23.3)	6	(20.0)
2	12	(40.0)	15	(50.0)
3	11	(36.7)	9	(30.0)

$p: 0.82$.

- Grading: 1. Easy removal
2. Average removal
3. Difficult removal

Table V Subjective assessment by the surgeon: Discomfort during removal

Grading	Needle		Drill	
	No. pat.	(%)	No. pat.	(%)
1	2	(10.0)	10	(33.3)
2	21	(70.0)	15	(55.0)
3	6	(20.0)	5	(16.7)

p: 0.1.

Grading: 1. No discomfort
2. Slightly uncomfortable
3. Uncomfortable

Table VI Subjective assessment by the surgeon: Discomfort during removal

Grading	Needle		Drill	
	No. pat.	(%)	No. pat.	(%)
1	4	(13.3)	5	(16.7)
2	18	(60.0)	18	(60.0)
3	6	(26.7)	5	(23.3)

p: 0.68.

Grading: 1. Good co-operation
2. Average co-operation
3. Poor co-operation

Table VII Results 2 days after removal

Grading	Needle		Drill	
	No.pat.	(%)	No.pat.	(%)
Number of patients treated	30	(100.0)	30	(100.0)
Number of patients returned	17	(56.6)	25	(83.3)
Number of patients returned with healed epithelium	4	(23.5)	10	(40.0)

the results of the subjective assessment by the surgeon. No significant difference was found between the groups.

Of the 60 patients treated, 42 (70 per cent) returned 2 days later, 25 (83.3 per cent) in the drill group compared with 17 (56.6 per cent) in the needle group. The epithelium had healed

completely in 10 (40 per cent) patients treated with a drill, while just 4 (23.5 per cent) in the needle group had a healed epithelium (Table VII). Because of the poorer turnout in the needle group, it is difficult to compare these figures statistically.

No complications arose in either of the groups.

Discussion

To our knowledge no comparative study of these methods has been done.

In 1975 Brown *et al.*⁹ compared removal of rust rings by either a electric drill or a manual drill. Their electric drill time was longer than ours, 70 seconds, but within our standard deviation. Manual drill removal time was 162 seconds in their study. Our study shows that the treatment time for the electric drill is significantly lower compared with a hypodermic needle, while other parameters are similar in these two treatment groups.

Our conclusion is, therefore, that both methods are very acceptable for removing rust rings, but the electric drill is a quicker method compared to an hypodermic needle.

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