

A prospective study of infrared coagulation, injection and rubber band ligation in the treatment of haemorrhoids

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Accepted: 24 January 1990

Abstract. One hundred patients with non-prolapsing and one hundred with prolapsing haemorrhoids were allocated to receive conventional treatment (CT) by injection sclerotherapy or rubber band ligation, or infrared photocoagulation (IRC). Significantly more patients with non-prolapsing haemorrhoids were symptom free after IRC (81%) than CT (59%) at three months. ($\text{Chi}^2 = 4.4$, $p = 0.05$). There was no significant difference in the outcome at 1 or 4 years. Likewise for prolapsing haemorrhoids, there was no significant difference in the outcome of IRC or CT at 3 months, one or 4 years. However, recurrence of prolapse was more common after IRC (54%) than rubber band ligation (RBL) (27%) at 1 year ($\text{Chi}^2 = 3.46$, $p < 0.1$). IRC was significantly less painful than CT ($p < 0.001$). IRC is a safe, rapid, non-invasive alternative to CT, which is acceptable to the patient and give similar results, though RBL provides more rapid and longer lasting relief from prolapse.

Introduction

Out-patient treatment of haemorrhoids can significantly reduce the cost of treatment of this common condition. Many alternative methods are being used with an accompanying reduction in the operation rate.

Injection sclerotherapy has been the mainstay of out-patient treatment for more than a century and deals adequately with most non-prolapsing, and some of the smaller prolapsing, haemorrhoids. Rubber band ligation has become more widely used for the treatment of prolapsing haemorrhoids and would seem to be as effective as haemorrhoidectomy in most cases of second degree haemorrhoids [1, 2]. A new technique, using infrared coagulation, was described in 1977 [3]. This prospective study was performed to evaluate the technique and compare it with injection sclerotherapy and rubber band ligation, both immediately after treatment and at 1 and 4 years later.

Patients and methods

Patients

One hundred consecutive patients with non-prolapsing haemorrhoids (Group I – 68 male, 32 female, mean age 38 years) and 100 with prolapsing haemorrhoids (Group II – 64 male, 36 female, mean age 49 years), suitable for out-patient treatment, attending specialist rectal clinics at three hospitals were entered into the study. Prolapse was defined according to whether or not the haemorrhoids were visible through a proctoscope placed at the anal margin when the patient was asked to strain. Patients were then randomized to receive either conventional treatment (CT-injection or rubber band ligation) or infrared coagulation (IRC). All patients were advised to increase the amount of fibre in their diet to avoid straining at stool. Assessments were made at intervals of 6 weeks by an independent observer and further treatment carried out as necessary. Further assessment was made, at interview, 3 months after completion of treatment and by questionnaire 1 and 4 years after treatment.

Treatment

For conventional treatment a decision was made on the suitability of the haemorrhoids for injection or rubber band ligation, depending on the size of the haemorrhoidal mass and the laxity of the mucosa, the larger haemorrhoids being allocated to rubber band ligation. Injection sclerotherapy was performed using 5% phenol in arachis oil in the standard manner [4]. Rubber band ligation was performed using a technique similar to that described by Groves et al. [6]; not more than two haemorrhoids were banded at any one attendance. Infrared photocoagulation was performed using a one second pulse at the base of each haemorrhoid, at a level one would normally select for injection. At least two points were coagulated per haemorrhoid, with as many as six if the haemorrhoid was particularly large [7].

Results

Group I: Non-prolapsing haemorrhoids

After two treatment sessions, 79 patients attended for assessment. Significantly more patients were symptom-free after infrared coagulation than following injection. Three months later, the same 79 patients were reassessed

with no change in the results (IRC 81%/injection 59%: Chi^2 4.4, $p=0.05$) (Table 1). There was no difference in the number of treatment sessions required to achieve symptomatic relief (IRC 2 ± 0.8 /injection 2 ± 0.7).

One year after completion of treatment, 73 patients returned a completed questionnaire; 36 had suffered further symptoms but 32 (89%) of these agreed that their symptoms were less severe than prior to treatment and only 7 (10%) had sought further medical treatment. There was no significant difference between the treatment methods used (Table 2).

Four years after completion of treatment, 43 patients returned another completed questionnaire. Twenty-nine (67%) had suffered further symptoms, 14 (33%) of whom had sought medical treatment. No patient required operative treatment in either group, although 2 in each group underwent further injection sclerotherapy and 1, previously photocoagulated, was treated by rubber band ligation. The remainder were given suppositories (Table 2).

Group II: Prolapsing haemorrhoids

In this group, of those receiving conventional treatment, 10 (20%) underwent injection and 40 (80%) rubber band ligation. Eighty-six patients were assessed after two treatments, more patients being symptom-free after infrared coagulation, but this was not statistically significant.

Three months later the same 86 patients attended for review. Again there was no significant difference in the results of the treatment methods, 65 (76%) of the patients remaining free of symptoms (Table 3). Slightly more treatment sessions were required for infrared coagulation (2.7 ± 0.8) than for conventional treatment (2.4 ± 0.8), but the difference was not statistically significant.

Table 1. Group I—non prolapsing, 3 months ($n=79$)

| | IRC | Injection |
|--------------|----------|-----------------------|
| Symptom free | 34 (81%) | 22 (59%) ^a |
| Improved | 7 (17%) | 11 (30%) |
| No change | 1 (2%) | 4 (11%) |
| | 42 | 37 |

^a $\text{Chi}^2=4.4$; $p=0.05$

Table 2. One year ($n=73$) and 4 years ($n=43$)

| | IRC | | Injection | |
|---------------------------|----------|----------|-----------|----------|
| | 1 year | 4 years | 1 year | 4 years |
| Symptom free | 20 (53%) | 5 (25%) | 17 (49%) | 9 (39%) |
| Recurrent symptoms | 18 (47%) | 15 (75%) | 18 (51%) | 14 (61%) |
| <i>Further treatment:</i> | | | | |
| Nil | 16 (88%) | 10 (67%) | 13 (72%) | 5 (36%) |
| GP treatment | 1 (6%) | 1 (7%) | 3 (17%) | 6 (43%) |
| Hospital treatment | 1 (6%) | 4 (26%) | 2 (11%) | 3 (21%) |
| | 38 | 20 | 35 | 23 |

Eighty-five patients returned completed questionnaires one year after treatment (Table 4). Fifty-four (64%) had recurrent symptoms but only 16 (19%) had sought further treatment. Of those with symptoms, 52 admitted that their symptoms were less than prior to initial treatment. There was no significant difference in the recurrence rate between the treatment methods. However, when types of symptom were analyzed separately, recurrence of prolapse was more common after infrared coagulation (54%) compared with rubber band ligation (27%), ($\text{Chi}^2=3.46$, $p<0.1$). Three who had infrared coagulation subsequently underwent haemorrhoidectomy. Of the 9 patients in the IRC group who underwent hospital treatment, 6 had rubber band ligation for persistent prolapse, 1 further infrared coagulation, 1 a haemorrhoidectomy, and 1 injection sclerotherapy.

Four years after completion of treatment, 73 patients returned completed questionnaires (Table 4). There was no significant increase in those with recurrent symptoms (63%) compared with those at 1 year. There was no increase in those seeking GP or hospital treatment, but one further patient had undergone haemorrhoidectomy.

Side effects

Six weeks after their first treatment, all patients were asked whether they had suffered any side effects (Table 5). The most common after effect of infrared coagulation was bleeding, occurring typically at 7–10 days after treatment, but in no case was this severe. In contrast, pain, usually described as a dull aching sensation commencing 1–2 hours after treatment and lasting for up to 48 h, occurred in 70% of cases undergoing injection and 60% after rubber band ligation, compared with 8% of patients after infrared coagulation ($\text{Chi}^2=71.3$, $p=0.001$). Despite the side effects, when questioned 1 year later, over 90% of patients stated that they would be prepared to undergo the same treatment again, with no significant difference between the treatment groups.

Discussion

Economic problems in the western world and the lengthening waiting lists for hospital admission have led to an

increased enthusiasm for out-patient treatment of minor surgical conditions. This is particularly true for haemorrhoids where the use of rubber band ligation in particular has dramatically reduced the operation rate in some centres. However, until the introduction of infrared coagulation by Neiger in 1977 [3], injection remained the treatment of choice for non-prolapsing and small prolapsing haemorrhoids. This time-honoured method is an invasive procedure which, although rarely, has been associated with septic and necrotic complications [4]. Pain can also be severe [5]. Infrared coagulation is a clean, rapid, non-invasive technique which is free of major complications [7].

The work of Thomson [8] has led to a better understanding of the nature of haemorrhoids. According to his theory, haemorrhoidectomy and cryotherapy are destroying the anal cushions involved in the continence mechanism, whereas injection sclerotherapy, rubber band ligation and infrared coagulation reduce the size of the enlarged cushions and fix the anal mucosa in the correct place. Infrared coagulation achieves this by ulceration at the points of contact of the probe, which heal by cicatrization, producing mucosal tethering. There is also an initial reduction in the blood flow to the haemorrhoid due to coagulation of the haemorrhoidal vessels.

Previous studies have randomized patients to receive either photocoagulation or injection sclerotherapy [9], or photocoagulation and rubber band ligation [10, 11], for first and second degree haemorrhoids. We sought to compare photocoagulation and injection sclerotherapy for first degree (non-prolapsing) haemorrhoids, and photocoagulation and either injection sclerotherapy or rubber band ligation in second degree (prolapsing) haemorrhoids, reflecting common out-patient practice in the United Kingdom.

At 1 year, our results for non-prolapsing haemorrhoids treated by either photocoagulation or injection sclerotherapy were similar to those of Ambrose et al. [9]. These results also showed that second degree haemorrhoids did not seem to do any better when treated by rubber band ligation than photocoagulation at 1 year, in agreement with Ambrose et al. [10] and Templeton et al. [11].

Symptomatic relief can therefore be achieved in the majority of patients without operative treatment and these results can be maintained for a period of twelve months in most cases, with few patients seeking further

Table 3. Group II—prolapsing, 3 months ($n=86$)

| | IRC | Conventional treatment | |
|--------------|----------|------------------------|----------------------|
| | | Injection | Rubber band ligation |
| Symptom free | 36 (80%) | 4 (50%) | 25 (76%) |
| Improved | 3 (7%) | 2 (25%) | 4 (12%) |
| No change | 5 (11%) | 1 (12%) | 1 (3%) |
| Worse | 1 (2%) | 1 (12%) | 3 (9%) |
| | 45 | 8 | 33 |

Table 4. One year ($n=85$) and 4 years ($n=73$)

| | IRC | | | | | | | |
|---------------------------|------------------------|----------|----------------------|---------|----------------------|----------|----------------------|----------|
| | Conventional treatment | | | | Rubber band ligation | | | |
| | Injection | | Rubber band ligation | | Injection | | Rubber band ligation | |
| | 1 year | 4 years | 1 year | 4 years | 1 year | 4 years | 1 year | 4 years |
| Symptom free | 17 (40%) | 17 (42%) | 1 (14%) | 1 (20%) | 13 (37%) | 9 (32%) | 15 (88%) | 15 (88%) |
| Recurrent symptoms | 26 (60%) | 23 (58%) | 6 (86%) | 4 (80%) | 22 (63%) | 19 (68%) | 1 (6%) | 1 (6%) |
| <i>Further treatment:</i> | | | | | | | | |
| Nil | 16 (61%) | 14 (61%) | 5 (83%) | 3 (80%) | 17 (77%) | 17 (77%) | 2 (9%) | 3 (14%) |
| GP treatment | 1 (4%) | 5 (22%) | 1 (17%) | 0 | 2 (9%) | 2 (9%) | 1 (6%) | 1 (6%) |
| Hospital treatment | 9 (35%) | 4 (17%) | 0 | 1 (20%) | 3 (14%) | 3 (14%) | 1 (6%) | 1 (6%) |
| | 43 | 40 | 7 | 5 | 35 | 28 | | |

Table 5. Side effects after treatment

| | IRC | Injection | Rubber band ligation |
|-------------------|----------|------------|----------------------|
| Nil | 69 (69%) | 16 (28.1%) | 11 (27.5%) |
| Pain ^a | 8 (8%) | 40 (70.2%) | 24 (60 %) |
| Bleeding | 21 (21%) | 6 (10.5%) | 6 (15 %) |
| Discharge | 3 (3%) | 1 (1.8%) | 1 (2.5%) |

^a $\chi^2 = 70.5$, $p < 0.001$

medical treatment. Follow-up at 4 years was limited by patient compliance. Only 43% of patients with non-prolapsing haemorrhoids and 73% with prolapsing haemorrhoids returned completed questionnaires. There appears to be a better response from those with recurrent symptoms than those who remained symptom-free. There was, however, no significant difference between those treated by photocoagulation or by conventional treatment for either non-prolapsing or prolapsing haemorrhoids. Although the numbers are too few to allow comment in the non-prolapsing group, there was no worsening of symptoms at 4 years compared to 1 year post-treatment in the prolapsing group.

When considering all symptoms our results showed no difference, either in the short term or long term, between infrared coagulation and rubber band ligation but it would appear that the latter provided more rapid and longer lasting relief from prolapse.

Our patients found infrared coagulation relatively painless when compared to the not uncommon aching discomfort after conventional treatment. Our staff found the infrared coagulator simple to maintain and prepare.

Conclusion

We have found infrared photocoagulation to be a safe, rapid, non-invasive alternative to sclerotherapy. It is more acceptable to the patient and likely to be more effective and safer than injection sclerotherapy when used by inexperienced surgeons. Out-patient methods are not

only acceptable to most patients, but also result in significantly less time away from work compared with operative management [1], resulting in financial saving to the National Health Service and to the patient's employer.

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