REFERENCES:

1. Morinaga K, Hasuda K, and Ikeda Y. A Novel therapy for Internal Hemorrhoids: Ligation of the Hemorrhoidal Artery with a newly devised instrument (Moricorn) in conjunction with a Doppler Flowmeter. *The American Journal of Gastroenterology* 1995;90: 610-613.

2. Thomson W H F. The Nature of Hemorrhoids. *Br. J. Surg*. 1975; 62:542-552.

3. Murie J A, Sim A J, Mackenzie I. Rubber band ligation versus hemorrhoidectomy for prolapsing hemorrhoids: a long term prospective clinical trial. *BR. J. Surg.* 1982; 69:536-538.

4. Buls J G Goldberg M. Modern Management of Hemorrhoids. *Surgical Clinics of North America* 1978; 58: 469-477.

5. Cheng F C Y, Shum D W P, Ong G B. The treatment of second degree Hemorrhoids by injection, maximal anal dilation, and Hemorrhoidectomy: A prospective clinical trial. *Aust. N.Z. J Surg*. 1981; 51: 458-462

6. Hodgson W J B, Morgan J. Ambulatory Hemorrhoidectomy with CO2 Laser. *Dis Colon Rectum* 1975; 38: 1265-1269.

7. Smith L E. Hemorrhoidectomy with Lasers and other contemporary modalities. *Surg Clin North Am* 1992; 72: 665-679.

8. Hardwick R H, Durdey P. Should rubber band ligation hemorrhoids be performed at the initial outpatient visit? 185-187.

9. Bat L, Melzer E, Koler M, Dreznick Z. Complications of Rubber Band Ligation of Symptomatic Internal Hemorrhoids. *Dis Colon Rectum* 1993; 36: 287-290

10. Rosen L, Sipe P Stasik J J, Rieter R D, Trimpi H D. Outcome of Delayed Hemorrhage following Surgical Hemorrhoidectomy. *Dis Colon Rectum* 1993; 36: 743-746.

11. Bleday R, Pena J P, Rothenberger M D, Buls G. Symptomatic Hemorrhoids: Current Incidence and Complications of Operative Therapy. *Dis Colon Rectum* 1992: 35: 477-481.

12. Goligher J. Hemorrhoids or Piles in: *Surgery of the Anus, Rectum and Colon*. London: Bailliere Tindall, 1985: 98-149

When we initially began doing this procedure, we ligated only three arteries, and then later, either four or five arteries. Only when we used the Color Doppler and found a constant six arteries did we routinely ligate all six. We have had eight cases of severe delayed hemorrhage. In all of these cases, either four or five arteries were ligated, there has not been any major secondary hemorrhage in those patients where the full six arterial ligation had been performed.

It is my contention therefore, that when four or five arteries were ligated, all the arterial pressure was thus borne by the remaining one or two arteries which ruptured. This, I think gives a plausible explanation for delayed secondary hemorrhage, after all methods of treatment. Also, the bleeding usually occurs in the second week post operatively, which allows for the remaining artery to weaken.

This study has therefore also shown, I believe, that a secondary hemorrhage is possibly the result of inadequate ligation of all the terminal branches of the Superior Rectal artery and not, as was previously thought, the result of infection.

CONCLUSION: I believe that we have shown Ultrasound-guided Hemorrhoidal artery ligation (HAL) to be a safe, effective method for the treatment of hemorrhoids and should in my view, largely replace radical hemorrhoidectomy as the definitive treatment thereof.

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It would appear that the cause of failure of this method is solely due to inadequate ligation of the terminal branches of hemorrhoidal (superior rectal) arteries. In those cases where the treatment had been unsuccessful, it became obvious immediately or within the first four weeks after treatment. Thereafter, (four weeks after treatment) only a small number (27) recurred. We believe that most of these (27) cases are due to the hemorrhoids receiving a major arterial contribution from the middle or inferior hemorrhoidal arteries. Because these arteries enter low down, they are unable to be ligated. These vessels could be clearly seen on duplex scanning. The only other problem which we have encountered is in patients who had suffered chronic symptoms of hemorrhoids and have developed large indurated skin tags. Although even these tags will shrink noticeably, they will not disappear completely and may have to be surgically removed. However, these skin tags are easily dealt with under local anaesthetic.

THE ADVANTAGES of this method are:

1. Hospitalization is not required. This is of great advantage, not only to the patient but also to the community at large by decreasing the ever burgeoning cost of health care.

2. The procedure is virtually pain-free. Compared to Rubber Band Ligation (RBL) which is usually the first line of treatment for symptomatic hemorrhoids, this is seen as a great advantage. A significantly large number of patients undergoing RBL do complain of pain. Also compared to RBL, other complications are significantly less.

3. Patients are able to return to work almost immediately - the majority return to work the following day. (Some have even returned to work on the same day).

4. All degrees of Hemorrhoids can be treated, however we advise conservative treatment initially for patients with acute, thrombosed hemorrhoids.

I believe that we have also shown fairly conclusively that hemorrhoids are basically vascular structures. It has been argued, and accepted by some, that hemorrhoids are the result of the anal mucosa “sliding down”. The fact that this method works so well, does I believe, refute that argument fairly conclusively. After successful ligation, the Hemorrhoids can be seen to shrink quite dramatically.

Unfortunately, we are still no nearer to establishing the exact pathology of the condition, however, my observations of the color Doppler pictures tend to make me believe that the pathology lies with the arteries which tend to be aneurysmal (micro-aneurysms) in nature. When the arterial wall becomes weakened beyond a certain point, rupture occurs, resulting in the typical bright red arterial bleeding experienced by patients. Full evaluation of this theory was beyond the scope of this paper.

Another important observation we have made was in relation to the question of delayed secondary hemorrhage.

Table 1. Complications

Complication	No. (%)
I. Severe secondary (delayed) hemorrhage	8 (0.56)
ii. Infection	7 (0.49)
Cellulitis	2
Abscess/fistulae	4
Septicaemia	1
iii. Anal fissures	14 (0.98)
iv. Perianal thrombosis	7 (0.49)

There were no cases of urinary retention

METHOD: No attempt was made in this study to compare with other methods. This was simply an attempt to verify the effectiveness of the method in a large number of patients over a suitable period of time without the need for statistical analysis. Other treatment methods and their results are well documented.

A total of 1415 consecutive patients were treated by the author between June 1995 and December 1996. There were 1045 males and 370 females (M:F ratio, 3:1). Age range 20-90 years with a mean age of 46. The age ranges for both sexes were similar.

Patients were followed up personally, by examination, and by a telephone questionnaire. The persons conducting the telephone interviews were told to simply ask the patients if they (the patients) thought that the treatment had been successful or not and if not, why not. Success was gauged by the fact that the patients were happy with the outcome of the treatment, i.e. their symptoms had been alleviated. All patients treated by this method were included even though a small number were subsequently found to have some other underlying problem and were therefore probably, in hind sight, not suitable for HAL treatment.

RESULTS: Of the 1415 patients treated, follow-up was completed in 1241, a response rate of 87.7%.

Of those responding, 1157 patients said that the treatment had been successful (93.2%) and 84 said that it had been unsuccessful (6.8%); Follow-up period 5-24 months.

DISCUSSION: Our indications for treatment by this method are the same as for radical surgery, i.e. symptomatic second and third degree hemorrhoids and patients with first degree hemorrhoids who are bleeding excessively resulting in Anemia. Our results show this method for the treatment of hemorrhoids to be, I believe, highly successful, with minimum side effects or complications.

We use a technique of suturing which we believe guarantees securing most of the arterial supply to the hemorrhoidal tissue, thus making the procedure highly effective. This technique will be described later.

We were fortunate enough to obtain a Color Ultrasound Duplex machine which we used over a six month period. A laparoscopic probe was used to insert into the anal. This machine enabled us to study the anatomy of the area in detail. We were particularly interested in the relationship between the Prostate and the arteries in the male because that organ is the only one potentially liable to be injured by the sutures. The color Doppler showed that the prostate had little chance of being injured.

We were also able to get "before and after" pictures which demonstrated the success or failure of the arterial ligation. These pictures recorded not only the vascular pattern, but also the arterial wave form; disappearance of the wave indicated successful ligation.

The Color Doppler also demonstrated clearly the number and position of the terminal arteries of the Superior Rectal Artery. Anatomy texts generally describe three terminal branches, one on the left and two on the right. Thomson however did correct this misconception after making a detailed study of the blood supply of the anal canal. He showed that there was a variable number of terminal arteries, with an average number of five. He was not able however to demonstrate a regular pattern of the vascular anatomy.

However, using the Color Doppler, we were able to determine that there are a constant six terminal arteries, in a constant position - 1,3,5,7,9,11 (as viewed in the anatomical lithotomy position) - in the upper anal canal. We believe that this is the first time that this anatomical arrangement has been reported.

We ligate the arteries, using 2-0 Vicryl, with a special technique alluded to above. The posterior arteries (3 and 5; and 7 and 9) are ligated together with a "double figure of eight" suture on each side. The anterior arteries (11 and 1) are ligated separately, also with "figure eight" sutures. At the completion of suturing, the arterial sounds will have disappeared. The hemorrhoidal tissue will be observed to commence shrinking immediately. No packing or dressings of any description are required.

Post operatively, patients return to a normal lifestyle almost immediately, eating a normal diet and using their bowels normally. However, we do advise patients not to undertake any strenuous activities for one week. Minimal post operative analgesia is usually required.

Relatively few complications were encountered in this series, making it a very safe procedure. They are listed in Table 1.

DOPPLER - GUIDED HEMORRHOIDAL ARTERY LIGATION (HAL) FOR THE TREATMENT OF HEMORRHOIDS- RESULTS IN 1415 PATIENTS

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SUMMARY

This paper details the results in 1415 patients, over a two year period, of a new method of treating hemorrhoids, using a technique described by Morinaga of Japan. We have however modified the technique which we believe improves the results.

I believe that our results show this method to be effective and safe and may also give an insight into the true nature of hemorrhoids and may also shed some light into the cause of secondary hemorrhage.

TECHNIQUE

The technique involves the use of a specially designed instrument, which is a modified proctoscope, housing a Doppler transducer, used to locate the arteries. It also has a light and a window through which the suturing is performed. No anaesthetic is used or required because the suturing is performed in the relatively insensitive part of the anal canal, above the dentate line. A long Needle Holder and a "knot pusher" are used for inserting the suture and tying the knots.

Patients are prepare by having fluids only by mouth from midday before the procedure and by using two "Microlax" enemas (Kabi Pharmacia AB). One the night before, and the other two hours before the procedure.

The patient is placed in the left lateral position, the area is prepared by applying Xylocaine ointment generously to the perianal and anal region. An examination is then performed, including procto-sigmoidoscopy. Having confirmed the diagnosis, the patient is then sedated with intravenous Midazolam (Roche).

The instrument is then gently inserted, having first prepared the area with Betadine solution. The arteries are located by listening to the sound transmitted via the "Echo Sounder", which is connected to the instrument, and are then ligated.

We have modified the Morinaga technique, which in our opinion, has a greater potential for improving the results.

Firstly, we do not change the position of the patient when doing the left and right sides. This is superfluous and only adds to the discomfort of the patient and prolongs the time of the procedure.