

## FIRST RESULTS AFTER LASER OBLITERATION OF FIRST- AND SECOND-DEGREE HAEMORRHOIDS

### Introduction

Symptomatic haemorrhoids of first and second degree are treated in the daily practice mostly with medicamentous sclerotherapy, rubber band ligation, infrared coagulation, and increasingly also with the haemorrhoidal artery ligation (HAL). Other methods, for example cryotherapy or diathermia coagulation, have not been widely performed.

In sclerotherapy, a substance is submucosal directly injected into the haemorrhoidal vessel [4] or above it [3]. Then, an inflammation reaction takes place and consequently a fibrotization with contraction, whereby mucosa and submucosa are attached to the subjacent muscularis mucosae. Existing bleeding should be detained or node prolapses should also be thereby avoided. Complications due to sclerotherapy are related to the depth and location of the injection, as well as the nature and quantity of the applied active substance [15]. Thrombosis, allergies and anaphylactic reactions, abscess and fistula creations, as well as massive bleeding in need of intervention could appear near the injected ulcer formations with bleeding and pains [21] [14].

Rectal necrosis [7], necrotize fasciitis [12] and retroperitoneale sepsis [2] were also reported. Contraindications for sclerotherapy persist by pregnancy, coagulopathy, inflammatory and infectious diseases [15].

The treatment of haemorrhoidal illness with rubber band ligation [1], takes place with a rubber band fixed above the haemorrhoidal nodes in the mucous membrane. Due to this setting an histoid necrosis appears, which leaves behind a histoid-ulcer after rejection, and also causes a fibrotization and thereby the fixation of the mucosa on the base. A significant amount of patients complained about the procedure because of pains, indispositions, abdominal fullness and unwanted stools [15]. Bleeding, ischuria, fever, abscesses, thrombosis and fistula formations could appear [11]. Tetanus, hepatic abscess, clostridial sepsis, Fourier-gangrene and lethal septic toxemia were reported [24]. Late allergic reactions to rubber additives with severe complications have been described [25].

The application of infrared-coagulation on enlarged haemorrhoids [19] takes place with a special photo-coagulation device. With the help of this equipment, circumscribed heat-necrosis are produced in the mucosa situated above the haemorrhoidal nodes. This ulcerates and cures by cicatrization within a few weeks, whereby an attachment of the mucosa and the subjacent tissue occurs. In addition to prolapse prprolapseion, a haemostatic effect should also be achieved. Pains due to treatment may appear [22], as well as post-therapeutic bleeding [11].

For a considerable time, HAL has also a place in the treatment of first and second haemorrhoidal illness [18]. With the help of a Dopplerultrasonic-controlled proctoscope, the supplying haemorrhoidal arteries are checked out and closed through suture ligation. Through decompression in the haemorrhoidal vessel system, contraction and retrocession of the enlarged haemorrhoidal plexus should be achieved. Current investigations of the supraanal vessel region ascribe the therapy success, however, first to a tightening of the tissues than to a mere ligation of the arteries [8]. Complications as bleeding, thromboses and pains are to be mentioned [6].

All these methods have the purpose of eliminating, existing complaints such as bleeding or node prolapses, and the thereby associated symptoms as anemia, itching, wetness, burnings and skin irritations. These are not semioperative procedures, which can mostly be executed under ambulatory praxis conditions.

The treatment spectrum of first- and second degree haemorrhoidal illness is enlarged by submucosal laser obliteration. By laser-energy dispensing on the haemorrhoidal vessel group, a fibrotic modification and degradation is achieved, due to the thermal damage of vessel endothelium. The haemorrhoidal plexus contraction and existing symptoms such as bleeding or prolapse are eliminated.

### Patients and methods

In the period from 06/2005 to 12/2005, 106 patients with first- and second- degree haemorrhoidal illness were subjected submitted to the laser treatment and were re-examined a year after therapy took place. Before the beginning of the treatment, one or several symptoms appeared, which were distributed as bleeding, (24.5%) about swelling conditions, 15 (14.1%) about burning and twelve (11.3%) complained about itching.

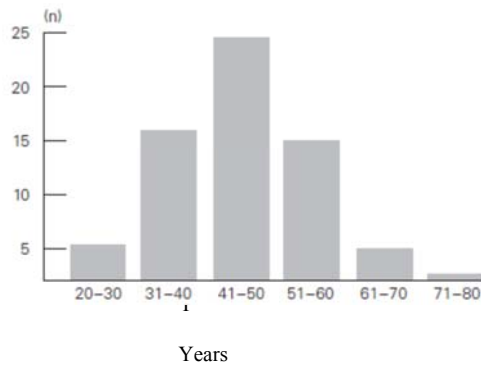


Illustration 1. Age distribution of the male patients.

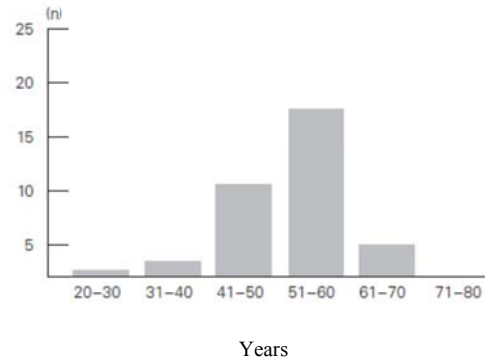


Illustration 2. Age distribution of the female patients.

After the first examination there were 74 patients (69.8%) with pure first-degree, and 32 (30.1%) with second-degree enlargement, i.e. an prolapse of at least one node is possible to be provoked (table 1).

Table 1. Staging and complaint percentages

Symptom	Patient	Proportion
First degree	74	69.8
Second-degree	32	30.1
Bleeding	81	76.4
Prolapse	26	24.5
Burning	15	14.1
Itching	12	11.3

68 patients (64.1%) were male, 38 (35.8%) female. The average age of the male patients was 44.9 years and of the female patients 52.4 years (illustrations 1 and 2).

The Ceralas D15 ELVeS laser (Endo laser Vein system; Biolitec AG, Jena) was applied for the treatment (illustration 3). This laser, which is a 980nm diode laser, was developed for endoluminalvaricose therapy. In this connection, a vein lumen fastener is achieved primarily by indirect heat effect. The laser energy is absorbed by the haemoglobin, which leads to a nucleation with thermal vessel wall damage. Consequently, it gets to a thrombotic obturation with fibrotic degeneration [26]. However, this principle also appears in the haemorrhoidal vessel collection which concerns about an arterial sponge corpus. Due to haemoglobin absorption, laser energy leads to an immediate occlusion and to the fusion of connective tissue formations drawn through blood chambers, which are consequently rebuilt and degraded. The vessel upholstery is so without tissue loss reduced.



Illustration 3. The Ceralas D15 ELVeS laser with laser providing cable.

The treatment was executed by all patients in lithotomy position (SSL) and lasted, from the introduction of the proctoscope up to its location, in an average distance of 6.8 min (illustration 4). The excision of the haemorrhoids took place with a proctoscope according to Blond with lateral window. Other storage positions or endoscopes are also possible, and are decided by the respective handler.

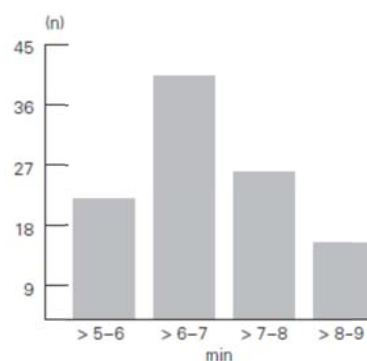


Illustration 4. Time required.

The detailed procedure is shown as follows, and photographic examples are provided:

1. After lubricant application, nodes are at 3:00 initially adjusted with the lateral window proctoscope in SSL (illustration 5). With a long cannula (Sterican 0.80 × 120 mm) maximum 1 ml of local anesthetic (Prilocain 2%) is administered directly close to the base of the haemorrhoids (illustration 6). With the cannula it is previously proved if the cannula's top is in the sensitive Anoderm found. Pain reception should be specified to continue the puncture further cranial.

2. Now, it is applied, with a handle providing 600-μ m-laser cable with an illuminated top, concentric aboral on the mucosa of the haemorrhoidal nodes (illustration 7). Beneath, delicate pressure is again applied to check, whether pain exists or not. By energy delivery the fiber tip is pushed forward whereby the mucosa is delicately penetrated, and comes to lie in the vessel plexus. By disconnection or reduction of the proctoscope lights, the location of the fiber tip inside the haemorrhoid could be detected.

3. The optical fiber is held approximately parallel to the proctoscope, so that the fiber tip is not located too deep and also not too superficial. In the laser's single pulse mode there are standardized energy amounts by 15 W in each case for 3 s. directly in the haemorrhoidal plexus. Besides, at least six pulses should take place per node, whereby two concentric oral-aboral and respectively two left and right lateral oral-aboral should be located in the node. The new placement of the fiber tip should always take place after light retraction, because, otherwise the vessel collection is only displaced and not penetrated once again.



Illustration 5. Haemorrhoidal node at 3:00h. In SSL.

4. Similarly, the remaining haemorrhoidal plexus and eventual satellite nodes are also treated. For small nodes it is enough with lower energy pulses.

Since the penetration of the laser energy from the fiber tip comes to approximately 5 mm, strict attention should be paid so that the fiber tip is placed not too superficially and also not too deeply in the node, i.e. not too close to the mucosa or in the inside of the constriction muscle. Otherwise, there is a risk of mucosa damage or muscle necrosis.

Illustration 6. Injection of the local anaesthesia with a long cannula.

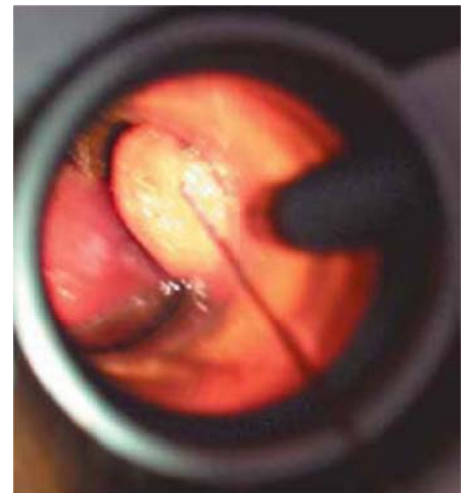
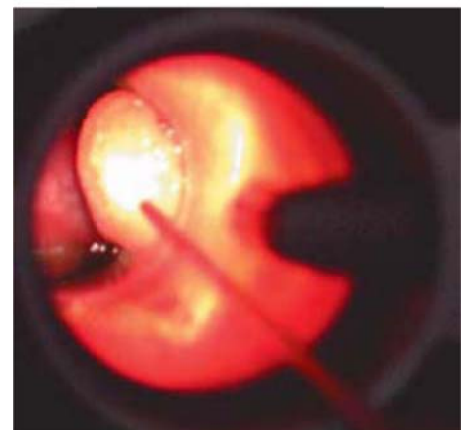


Illustration 7. Introducing the laser fiber in the hemorrhoidal node with the handle



While pushing the fiber tip forward, bleeding could occur because of vessel damage, which appears as a submucosa haematoma. The treatment should then not be canceled, but be continued, because due to energy delivery the vessels get closed. Additionally, the bleeding could be nursed by a simple pressuring tamponade with a cotton applicator, and the haematoma could be distributed.

Pulse energy should be adapted to the node size, i.e., bigger nodes should be treated as much as possible with more than six energy pulses by which the efficiency increases. By a low quantity, the effect remains insufficient and the second session should be developed.

Extraction of the optic fiber briefly causes bleeding at the entry. This bleeding detains by itself, but can be also prevented if the extraction takes place while delivering energy. The entry would thereby be closed.

If the fiber tip penetrates the mucosa easily without energy delivery with minimum pressure, extreme precaution is required, because fragile mucosa can be damaged very easily from inside. In case of doubt, the treatment should not be executed.

It should be observed that the onset of effect, i.e. the renovation process, takes place not immediately but in approximately four days, even if at the moment of the energy delivery a reduction of the node can be observed. The patient should be notified of this circumstance.

The patient can routinely be asked after four weeks for checking purposes, and be submitted if necessary to a second session. Particularly with bigger nodes and insufficient pulse amount, this could be required. After some practice, the second session does not need to take place. If there are new complaints the patient can be submitted again to a second session.

## Results

All patients were standardly examined after four weeks, and when necessary they were given a second session. Thereby only the insufficient treated nodes were treated again. 52 (49.1%) of the patients required a second session, among them 37 (34.9%) in more than one node. In six patients (5.7%) the third session was executed within twelve weeks. With the increase of the practice, the number of the second sessions of treatment decreased.

A year after the first treatment, 94 patients (88.7%) were completely free of pain, in twelve patients (11.3%) complaints appeared again (illustration 8). Among them two patients (1.9%) reported renewed bleeding and ten (9.4%) further swelling conditions, burnings and pruritus.

The 79%, of the 81 patients with bleeding complaints, had no renewed bleeding prolapse after one year (illustration 9).

From examination after one year, a node prolapse could be caused in ten patients (9.4%), i.e., from the 32 patients who present prolapse before the treatment, 22 (68.8%) did not have a renewed node prolapse, while in ten patients (31.2%) a renewed or not improved a prolapse was found (illustration 10).

Illustration 8.  
Results from one year after laser obliteration. (11.3% not free of complaints, 88.7% free of complaints)

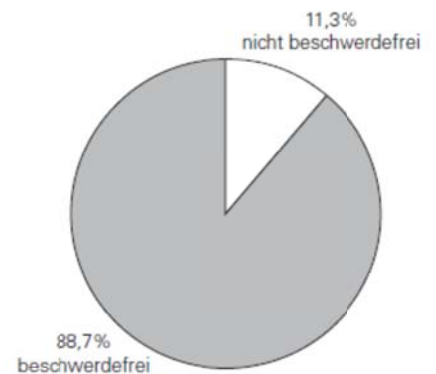


Illustration 9.  
Results from one year by bleeding. (2.5 % with bleeding, 97.5% free of bleeding)

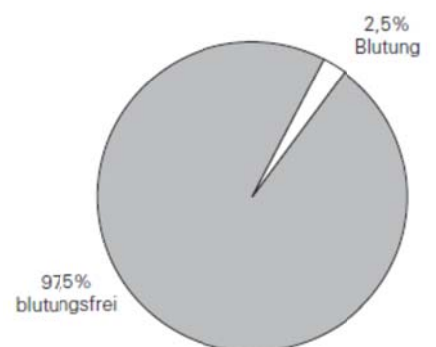
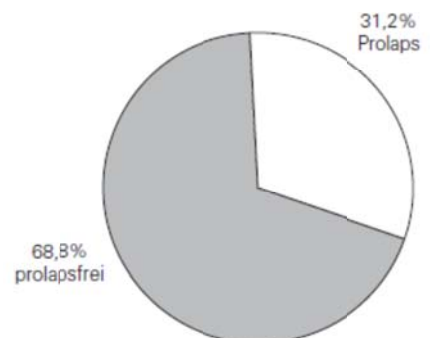


Illustration 10.  
Results from one year by prolapse. (31.2% with prolapse, 68.8% free of prolapse)



Two patients (1.9%) developed a submucous hematoma during the treatment, which needed no treatment. One patient (0.9%) suffered a posttherapeutic mucosa damage, which had to be treated surgically by ligatures. Other complications did not occur during the process.

The first 20 treated patients felt without exception during the energy delivery, a warm feeling, eight patients (40%) also presented a painful paraesthesia which led to a truncation or to an inadequate treatment. Post-therapeutic, six patients (30%) reported a continuous paraesthesia during some hours, which was adequately treated with a single administration of anti-inflammatory medication (Diclofenac 100 mg).

After application of local anaesthesia, all the following 86 patients were free of pain during the treatment and also post-therapeutic.

## Discussion

Patients with first- and second-degree haemorrhoidal illness attend to proctologic consulting hours mostly because of bleeding [5]. The usual procedure methods incorporated to the dietary adjustments and to simple application of local medication, sclerotherapy, rubber band ligation, infrared-coagulation, and since some time, the Doppler-controlled HAL. These nonoperative or semioperative methods can be performed ambulatory under medical supervision, although significant complications may occur. These complications are measured and considered a low number, but for the patient are however very unpleasant.

The results of treatment have been based on numerous studies. Sclerotherapy according to Blond, after a primary success rate of the 80%, has a rate of recurrence of the 70% after 3 years [10]. With rubber band ligation a primary success rate of the 95% was reported [9], and after 3-5 years, success rates from > 70% were registered [20]. Infrared coagulation shows different results. While some authors did not find significant differences with excessive bleeding haemorrhoids of the first degree to the rubber band ligation [16, 17], other

users have in the short term course a success rate of the 81% as opposed to the 59%, by considering sclerotherapy as well as the rubber band ligation [23]. However, in other studies this technology showed worse results [13], after just 6 months with 69% recurrence as opposed to the 19% with sclerotherapy.

For Doppler-controlled HAL different therapy success between 50% and 90% was reported. Concluding judgments with regards to the indication and effect still lack [10].

With submucosal laser obliteration a therapy success of the 88.7% appears one year after the treatment of first- and second-degree haemorrhoidal illness. With bleeding haemorrhoids a success rate of the 97.5% was achieved, while for the node prolapse only a rate of the 68.8% was found.

The worse results with the node prolapse are based most likely on the size of the node, or the inadequate pulse number and pulse amount. A fibrotic reconstruction and degradation of the haemorrhoidal vessel upholstery will be achieved by the submucosa laser-energy delivery. That leads to a reduction and with it the shriveling of the node. If nodes are too big or if the delivered energy pulses are too low, this process will not be sufficient to remove the prolapse. The occurring fixation of the haemorrhoidal plexus, on the base [5, 15], takes place with sclerotherapy, infrared coagulation, rubber band ligation and also takes place with laser energy, and has not so far been examined histologically. This can not be clinically confirmed. Satisfactory treated nodes, were harder by the digital control after four weeks, and had completely disappeared after one year. Nodes had clearly shrunk in volume; non-relocatability or resistance can not be digitally verified.

Particularly with the patients treated in the initial phase, the desired success was not achieved; then with increasing practice a single treatment session was sufficient enough to ensure success of the treatment. Up to now, the complications observed by the other methods did not occur with the laser obliteration. Only with the wrong technique, mucosa necrosis with subsequent bleeding should

be particularly considered. Particularly in older patients with fragile mucosa big attention is needed; in case of doubt, the procedure should not be executed in the learning phase.

Possible muscle necrosis did not occur, due to too deep placement. It would only circumscribe the fiber tip concerned, by which no functional losses would be feared. Besides, the inside anal sphincter represents a perceptive flexible resistance, in order to avoid too deep placement.

During the treatment two submucosal haematoma appeared, which could be quickly controlled and needed no other therapy. To prevent possible complications, a foregoing treatment is offered to patients with not adjusted coagulopathies. Apart from possible allergies to local anaesthesia there are no other contraindications; inflammatory bowel disease is particularly contraindicated for sclerotherapy. Infectious anal injuries and gravidity [15] represent no obstacle.

Bleeding is considered a superficial symptom, and can be effectively treated with laser obliteration. This is in opposition to the prime selection of sclerotherapy and infrared coagulation as therapies for first-degree haemorrhoidal illness. This has clearly been mentioned in bibliography during the last years [10]. In this context, better short-term results favor laser treatment, the application often requires only few times and, first of all, comparatively it is a fewer complicated technique.

The rubber band ligature is a feasible therapy of election for second-degree haemorrhoidal illness, it could be considered the exclusive laser treatment to be executed, although it has more complications and needs repeated sessions. Reduction of the vessels' upholstery produced by laser energy does not seem to remove the prolapse in bigger nodes. In one third of the patients, after one year, a node prolapse was noticeable.

For this reason, occurs meanwhile in bigger second-degree haemorrhoidal nodes, a histoid fixation is achieved with the help of suture ligatures, and in the case of requiring a second session, additional energy delivery in the submucosa can be applied. This is executed by

lateral window proctoscopy, as with HAL, beginning proximal to the haemorrhoidal nodes, and then distal repeatedly with a Vicryl suture of 2/0 strength broke up, and the suture is fixed with a node slidegate valve. So far, better results are achieved by these combined actions than by exclusively using the laser treatment on existing haemorrhoidal prolapse; although the evaluation still stands.

After overcoming the learning phase, patients do not need to be controlled routinely after some weeks any more. If complaints reappear, they should attend to medical consultation. Then, a second session can take place if necessary, in combination with additional suture ligatures.

Disadvantages of laser obliteration are unequivocally the high cost of equipment and the cost of materials. The device costs about 30.000€ and a laser fiber approx. 300€. However, some materials could be reused, so that the expenses decrease. Besides, a sufficient sterility is guaranteed by cutting the top of the fiber after every use and also by gas sterilization.

Also the (facultative) application of a local anesthesia can be considered as a disadvantage.

## **Conclusion**

The author is conscious that the present retrospective study corresponds only to the experiences of an individual handler, and the low evidence degree requires multicenter prospective examinations to increase verifications.

Under these conditions could be however verify that, with the help of the Ceralas D15 ELVeS laser, a new procedure is available for the treatment of first and second-degree hemorrhoidal illness.

After the first results, the scope of this method lies in the bleeding hemorrhoidal illness, reaching success after a few days. In contrast to former procedures, it requires no treating medication or external materials, and apart from the puncture site, remains the mucosal integrity preserved. The complications described in other techniques have

so far not appeared. The first annual results are considerably better for the bleeding treatment; the success of treatment of haemorrhoidal prolapses through sole laser treatment is lower. Long-term results are not yet available.

The high purchase price of the laser equipment as well as the cost of materials could be regarded as a disadvantage. These costs are lately reduced through multiple uses, after appropriate sterilization measures. Also the (facultative) application of a local anesthesia could be considered as a disadvantage.

The advantage for user and patient lies in the painless, brief and often unique execution, with minor complications and few contraindications.

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