Novel Technique: Radiofrequency Coagulation -- A Treatment Alternative for Early-Stage Hemorrhoids

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Disclosures
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Discussion
Radiosurgery, not to be confused with electrosurgery, diathermy, spark-gap circuitry, or electrocautery, uses a very high-frequency radio wave. Unlike electrocautery or diathermy, the electrode used in radiofrequency surgery remains cold. The latter is possible because of the use of the very high-frequency current of 4 MHz, vs the 0.5-1.5 MHz energy used in the electrocautery procedure. In contrast to true cautery, which causes damage similar to third-degree burns, the tissue damage that occurs with radiofrequency surgery is very superficial and compares well with damage occurring with lasers.\(^7\)

Histologically, it has been shown that there is less tissue damage produced with radiosurgery than with a conventional scalpel, and comparable damage to that caused by a cold scalpel.\(^8\)

Hemorrhoidal coagulation with radiofrequency energy occurs through the application of a high-frequency current which, when applied to tissue with sufficient current intensity, dehydrates the cells and coagulates their organic contents. This action is evidently self-limiting, because the surface coagulation helps protect the underlying tissues.\(^9\)

The results of our study are comparable with those obtained with infrared coagulation and band ligation, as previously observed by Nevah,\(^10\) O'Holleran,\(^11\) Walker and colleagues,\(^12\) and Johanson and Rimm.\(^13\)

Radiofrequency coagulation has many advantages\(^14\) in the treatment of hemorrhoids. The procedure is safe, easy to perform, and rapid -- coagulation takes generally between 5 and 10 seconds. Additionally, radiofrequency coagulation may be performed as an in-office procedure. In infrared coagulation, the pedicle is coagulated. Thus, the goal is to cut off the vascular supply to the hemorrhoid. However, at times, this coagulation cannot effectively control all of the blood vessels feeding the pile mass. This scenario increases the possibility of incomplete destruction of hemorrhoids or the possibility of recurrence. In radiofrequency ablation, the pile mass is directly coagulated,\(^15\) and this facilitates the immediate disappearance of the hemorrhoid. Radiofrequency coagulation also helps in tethering the mucosa to the
rectal wall, which minimizes the chance of recurrence. The human body essentially reacts as an electrolyte liquid in that the more hydrated the tissue, the more easily the electric current passes through the body. Therefore, when the hemorrhoids containing blood (fluid) are exposed to the radiofrequency wave, the fluid is desiccated and the pile mass shrinks. This procedure is comparatively less expensive than laser therapy, and requires no disposable instruments or costly medications. Additionally, pregnancy is not a contraindication to radiofrequency coagulation -- 4 of the female patients in our study were in their second trimester of pregnancy and were referred by their gynecologist for rectal bleeding. These patients had failed to respond to conservative treatment (oral laxatives, local ointments, nonconstipating diets), and were found to have internal bleeding hemorrhoids. Following radiofrequency coagulation, these patients had an uneventful antenatal period and improvement in their rectal bleeding.

In general, radiofrequency coagulation is a comfortable procedure because it does not require any invasive anesthesia. There may be the need for repeat procedure, but this is seldom resisted by patients as it is quick and safe to perform. As compared with laser or electrocoagulation, associated injury to bone or periosteum is unknown in radiosurgery. The associated pain during procedure is much less with radiofrequency coagulation than with band ligation. Moreover, the life-threatening complications such as pelvic cellulitis, tetanus, rectovaginal fistula, liver abscess, and bacteremia sometimes associated with band ligation have not been reported in the radiosurgery procedure. Furthermore, the radiofrequency approach is easily performed without the need for antibiotics or sterile technique (the radiofrequency surgical current provides sterilization while in use). Because of the low level of tissue destruction and controlled direction of the radio wave current, there is generally much less postoperative pain, swelling, and risk of infection than is generally experienced with other techniques. As briefly indicated previously, radiosurgery creates minimal collateral heat damage in the tissue; thus there is rapid healing and no scarring. Biopsies performed of the skin tissue indicate a maximum thickness of heat-denatured collagen of 75 mcm; the latter is equal to (or even better than) that which occurs with carbon dioxide laser used for cutting. Important to note is that during infrared coagulation, the lamp of the infrared coagulator, which is positioned toward the surgeon, heats up after only a few applications and needs to be kept idle for a "cooling down" period between later applications. The latter results in prolonging the overall procedure time and adds to the discomfort of the patient who is lying in an awkward position; this effect does not occur in
radiofrequency coagulation. Compared with cryotherapy, in which the time required for procedure is too long and overall patient discomfort much greater, radiofrequency coagulation again represents a quick and pain-free option. Even despite the aforementioned reasons, cryosurgery is not justified as a primary treatment in this setting.\[24\]

As noted earlier, because the frequency employed by the radio wave unit is very high, the current from the instrument passes through the body without causing painful muscle contractions or nerve stimulation (Faraday effects).\[25\] The latter property helps to allow the coagulation of hemorrhoids without anesthesia if the hemorrhoids are above the dentate line. Results achieved with radiofrequency are better than those achieved with sclerotherapy, which is associated with greater discomfort and occurrence of complications such as sepsis and thrombosis. Direct-current probe (Ultroid; Cabot Medical, Langhorn, Pennsylvania) has also been promoted as an alternative to conventional procedures for treatment of hemorrhoids. However, the associated procedure time is too long (8-10 minutes or more), resulting in a considerable amount of discomfort to the patient. It is also quite cumbersome for the surgeon to hold the probe for such a long duration. Furthermore, direct-current probe is associated with incidences of sepsis, subsequently leading to abscess and fistula-in-ano.\[26\]

As a final note, the versatility of the radio wave instrument is such that at a frequency of 4 MHz, it can perform cutting, simultaneous cutting and coagulation, and pure coagulation, whereas at a frequency of 1.7 MHz, it can effectively fulgurate/desiccate the tissues. These multiple functions of the radiofrequency equipment are helpful in other anorectal settings as well, including fistula, sentinel hemorrhoids, hypertrophied anal papillae, and fibrous anal polyps.\[16,27\] Thus, the radiofrequency unit may be used as a versatile and multimodal tool in the proctology practice.\[28\]