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RADIOFREQUENCY: A NEW APPROACH TO ANO-RECTAL SURGERY

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ABSTRACT
Background - Radiofrequency surgery is a method of utilizing high frequency [3.8 to 4MHz] radio wave energy to incise, excise, or coagulate tissues. Radiofrequency is a relatively new modality that is being used for ano-rectal surgeries with increasing frequency.
Objective - This paper discusses pre-clinical and early clinical experience with radiofrequency for various ano-rectal procedures namely hemorrhoids, anal fistula, anal polyps, sinuses and anal papillae. A Ellman dual frequency radiofrequency generator was used to carry out the procedures.
Conclusion - Radiofrequency proctological procedures are simple to perform with many advantages over the more traditional techniques. The procedures take less operative time, the postoperative recovery is accelerated and the incidences of complications are negligible. Nevertheless, randomized and comparative evaluation with conventional techniques is called for to establish the long-term efficacy and reliability of radiofrequency surgery.
Keywords - Radiofrequency Proctology Electrosurgery Hemorrhoids Anal fistula

INTRODUCTION

Radiofrequency surgery is a modern electrosurgery, which has a lengthy documented history of use in oral, ophthalmic, plastic and gynecology surgery. Gradually, its use in the practice of thoracic surgery [**1**], dermatology, cosmetology [**2**], neurosurgery, hepatology and ENT procedures [**3,4**] gained momentum and popularity. It has multifaceted usages in the respective surgical fields [**5**]. However, there have been few published reports of its use in proctology.

Radio surgery can simply be termed as an electro surgery at radiofrequency. The term 'radio' is used because the frequency of the device creating these waves is comparable to radio wave frequency used for broadcasting. It is necessary here to dispel any possible misconception about radio surgery by discussing two other older modalities namely, 'electrocautery' and 'hyfrecation' that are quite different from radio surgery.

With radiofrequency, the targeted tissue temperatures stay localized within a 60-90°C range thus limiting heat dissipation and damage to adjacent tissue. In contrast, electrocautery, diathermy or laser temperatures are significantly higher (750-900°C) and result in significant heat propagation, which is far in excess of the desired therapeutic need **[**6**]**.

Electro surgical machines operating at frequencies below 3 MHz cause the electrode itself getting heated and being generally made of steel, tends to melt away with repeated use. It stands established that for achieving effortless cutting of tissues, the ideal frequency should measure approximately 4 MHz **[**7**]**.

Radiofrequency energy has been used extensively in many different surgical applications and specialties for its ability to achieve a precise and controlled thermal ablation of soft tissue. The heat for this ablation is generated by a natural resistance of the tissue, which comes in the path of the waves released through the tip of the electrode. The cellular water in the soft tissue gets heated and when the temperature reaches 100^0 C, it starts boiling and produces steam, which results in cellular molecular dissolution of individual tissue cells. The tissue cells exposed to these waves are destroyed while the surrounding tissue remains unaffected. This property of radiofrequency eliminates the possibility of undue damage to the healthy tissues, while improving the surgical precision **[**8**]**.

The radio surgical unit functions with the active electrode concentrating the high frequency electrical energy at its tip, and then transmitting it to the passive electrode which returns the waves to the unit, making them more effective **[**9**]**.

The radiofrequency unit- While different radiofrequency units are available in the market, we found the Ellman dual frequency 4MHz unit, with a proven history of its efficacy and being available with a multitude of electrode tips, quite useful in carrying out various proctological procedures. The unit produces output power of 100 Watts at two different frequencies i.e. 4MHz and 1.7MHz. While the frequency of 4MHz is used for four standard settings like 1. Cutting, 2. Cutting and Coagulation, 3. Pure coagulation and 4.Fulguration, the frequency of 1.7MHz is used for bipolar coagulation **[**10**]**. The unit has an audible signal to indicate when the unit is activated. Two distinguishing sounds are produced for cut and coagulation mode. The output power intensity to be delivered through the electrode can be preset between 1 and 100, such readings being digitally displayed over the device.

Illustration 1 – The Ellman radiofrequency generator

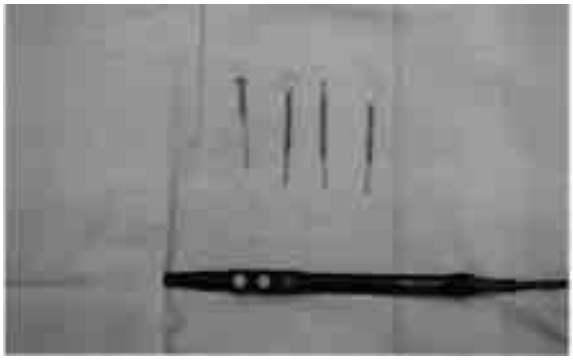

Illustration 2-The handle and various electrodes of radiofrequency device

An 'antenna' is used to focus the "radio wave" which unlike traditional electro surgical units, does not come in contact with the skin of the patient. It could be placed in close proximity of the operating field. The antenna plate serves to focus the radio waves, and helps in concentrating the waves at the electrode site. The unit is activated by a foot pedal. The 'active' or patient electrode is interchangeable with four different modes of activities [11].

A Needle electrode, used for making incisions;

Loop electrodes, which are used for excision and shaping tissues;

Ball electrode which is used for coagulation; and

Rod electrodes, which are used for fulguration and desiccation.

We have been working with this equipment since last 5 years to perform most of the proctological surgeries. The property of the device that achieves simultaneous cutting and coagulation has attracted us the most. Such versatility of the tool is of utmost utility in most procedures performed within the ano rectal area, which is vascular and has a very limited accessibility. While operating in such a difficult area, bleeding and oozing from the tissue often hampers the clear vision of the operative field, rendering the procedure a difficult and time consuming job. Radiofrequency technique successfully overcomes this deficiency.

Indications for using radiofrequency surgery in proctology –

Radiofrequency surgery can be used for a variety of anal lesions. They include-

· Hypertrophied anal papillae [12] · External hemorrhoids · Sentinel tags in anal fissure [13] · Perianal warts and ondylomata · Rectal polyps · Fibrous anal polyps [14] · Perianal and pilonidal sinuses [15] · Post fissure antibiomas · Perianal papillomas · Biopsies [16] · Anal Fistula [17] · Hemorrhoids [18,19] · Rectal prolapse [20]

Most procedures are accomplished under local anesthesia, short-term general anesthesia or under a caudal block. Most of the procedures could be performed using the loop, the ball and the fine needle electrode.

Post-Operative Care

Almost all the abovementioned procedures are carried out as day care surgeries. Analgesics, antibiotics and stool softeners are prescribed according to the departmental protocol. No specific wound care was found needed, except a warm water sitz bath two times a day.

Complications

No major complications have been encountered with these procedures. Few minor ones to mention are-

Deep dissection can cause more scarring and longer time for healing of the wounds.

Excessive release of power produces more smoke and charring.

Accidental burns either on the patient or on operator due to unintended activation of hand piece can occur.

Precautions to be taken while operating with radiofrequency unit- Radiofrequency procedures should not be employed by, or on anyone who wears a pacemaker. The instrument should not be used in the presence of flammable or explosive liquids or gases. The skin under treatment should not be prepped with alcohol.

If proper settings are not known, the operator should start with low power setting and cautiously increase power until an ideal cut is accomplished, without a tissue drag and with no sparking. The finer the electrode used, the less lateral heat spread and to cause least damage to the adjacent tissues.

Other advantages-

Radiofrequency surgery allows cutting without pressure, and, consequently, there is little tissue damage and minimal scarring [21]. The electrode tip remains sterile, as also all the tissue that is exposed to it [22]. Healing is by granulation, with a soft supple scar and no excessive fibrous scar tissue [23]. It could perform with ease in depth and in difficult areas like the anal canal. There are minimal incidences of postoperative infection, thereby achieving faster wound healing with negligible use of sutures etc.

Because of the low level of tissue destruction and controlled direction of the radio wave current, there is generally lesser postoperative pain and edema than that is normally experienced with comparable techniques.

CONCLUSION

Based on our personal experience and weighing the pros and cons of the technique, we are of the opinion that radiofrequency surgery could certainly prove to be a safe and convenient alternative to many of the conventional ano rectal procedures.

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