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Surgical Treatment with Radiofrequencies for Outpatients with Surgical Benign Ano-Perianal Diseases

V. Radu[1], S. Radu[2], D.S. Vasilescu[3], P. Mustatea[4], S. Constantinoiu[5]

[1]"PROCTOLINE" International Medical Center, Bucharest, Romania
[2]Departament of Gynecology, "POLISANO" Clinic, Bucharest, Romania
[3]Department of Biomaterials and Polymer Science, University Politehnica, Bucharest, Romania
[4]„Prof. N.C. Paulescu" National Institute of Diabetes, Nutrition and Metabolic Diseases, Bucharest, Romania
[5]General and Esophageal Surgery Department, Excellency Center for Esophageal Surgery, "St. Mary" Clinical Hospital
"Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

Rezumat

Tratamentul chirurgical ambulator cu radiofrecvență al afecțiunilor chirurgicale ano-perianale benigne

Introducere: Incidența afecțiunilor chirurgicale ano-perianale benigne (ACAPB) este în creştere. Radiofrecvența (RF), ca metodă terapeutică chirurgicală, foloseşte undele radio de frecvență înaltă pentru incizie, excizie şi coagularea țesuturilor. Obiectivul studiului este de a demonstra posibilitatea de a utiliza RF în tratamentul chirurgical ambulator al ACAPB cât şi eficiența acesteia comparativ cu alte tehnici chirurgicale.
Material şi metodă: Studiul retrospectiv a fost realizat pe o perioadă de 11 ani (decembrie 2003 - decembrie 2014), în Centrul Medical Internațional "Proctoline" din Bucureşti (România), pe un lot de 783 pacienți, operați cu RF pentru 10 tipuri de ACAPB, în condiții de ambulatoriu. S-au practicat intervenții chirurgicale cu RF, sub anestezie locală, de tipul: tomii, ectomii, excizii, curetaje, etc.
Rezultate: Durata intervențiilor nu a depăşit 45 de minute, iar durata de vindecare totală a variat între 7şi 45 de zile post-operator. Rata complicațiilor minore este mică (8,3%). S-au înregistrat rezultate foarte bune posttratament (la max. 11 ani), pacienții prezentându-se la controale periodice la 1 şi 4 săptămâni.
Concluzii: RF este o metodă foarte eficientă, rapidă şi sigură de tratament al ACAPB în ambulatoriu, utilizată doar cu anestezie locală, oferind pacientului un minim disconfort postoperator şi o regenerare tisulară rapidă, estetică şi funcțională în timp. Comparativ cu metoda „clasică" chirurgicală, complicațiile sunt minore şi cantitativ scăzute.

Cuvinte cheie: radiofrecvență, afecțiuni chirurgicale ano-perianale benigne, ambulator, anestezie locală

Abstract

Introduction: Nowadays, the occurrence of surgical benign ano-perianal diseases (SBAPD) is raising. Radiofrequency (RF) represents a surgical therapeutic method using high frequency radio waves to perform incisions, excisions and tissue coagulation. The main purpose of the study is to validate the possibility to use RF within the surgical treatment for outpatients with SBAPD; at the same time, a special consideration has been given to appreciate the efficiency of RF compared with other surgical methods.
Material and method: The study presents the results accumulated

Corresponding author: Viorel Radu, MD
"Proctoline" International Medical Center
Bucharest, Romania
E-mail: raduviorelmihai@gmail.com

in 11 years (December 2003 – December 2014) in "PROCTO-LINE" International Medical Center; also, we have taken into account the accomplishments on 783 outpatients, submitted to RF surgery for 10 different types of SBAPD. Various RF surgeries (cuttings, excisions, coagulations, curettages etc.) have been performed under local anesthesia.
Results: The necessary time was usually less than 45 minutes, while the post-operatory duration for a total healing was in the range of 7 to 45 days. The percentage of minor complications was quite a small one (8,3%). Also, we might appreciate excellent post-treatment results (maximum value of 11 years); Typically, the patients return for periodic postoperative examination at first and fourth week after surgery.
Conclusions: RF represents an efficient, rapid and secure method for the treatment of SBAPD; it may be used in ambulatory, only under local anesthesia, offering to the patient a minimal post-operatory discomfort, as well as a rapid, esthetic and functional recovery of wound. By comparison with "classical surgery", the complications are rather minor ones and their percentage occurs in a lesser one.

Key words: radiofrequency, surgery in benign ano-perianal pathology for outpatients, local anesthesia

Introduction

The surgical benign ano-perianal diseases (SBAPD) includes several widely spread affections. The impressive frequency of SBAPD is now increasing, thus revealing the consequences of modern life (inadequate nourishing, stress, sedentary life, etc) thus, lately getting a social aspect; for instance, the haemorrhoidal disease can be met at 60% to 80% from the adult population (1). SBAPD can be responsible for important physical or psychic nuisances with a major potential for natural evolution towards redoubtable complications or sequels, occasionally producing infirmities (2).

The consequences as well as the unsure results and the implied sufferings characteristic after 'classical" surgical interventions in anal sphere have produced significant changes in the treatment of these diseases; the adjustments of classical methods were due to the recent discoveries related to pathogeny of anal syndromes. The great majority of these new methods are nowadays performed in ambulatories, under local anesthesia, being relatively non-painful, without obvious complications and leaving the patient engaged in his current activities (2).

One of these novel techniques is the AMBULATORY PROCTOLOGIC RADIOSURGERY; this system uses radio waves of high frequency (3.8-4.0 MHz) for cutting, excision and/or coagulation of tissues.

A short history

The use of electricity in surgery started with a spark generator (1907), continued with cauterization units (1909) up to the first electro-surgery devices (1928); all of them were characterized by a dispersion of a high amount of heat. The used frequencies were in the range 0.5 to 2 KHz, producing serious burns on neighboring tissues (3).

D'Arsonval (French physicist and physiologist 1851-1940) has performed the first tests regarding the use of RF currents on human body. Heinrich Hertz (German physicist 1857-1894) had manufactured a device that produced high frequency currents, overtaking the barrier of 10 KHz (4). In 1950 Dr. Leonard Malis developed the first "bipolar" device, where two electrodes were used for holding of tissue. (5). Tests performed on some mammals (rats, pigs, Rhesus monkeys) have proved that exposure to radiofrequencies is entirely compatible with life (4).

Dr. Arthur A. Goldstein (Monaco) introduced the word "radiosurgery" so that to differentiate the device invented in 1969 (Irving Ellman) (6) using high frequency radio waves (3,8 MHz) from "electrosurgery" characterized by low frequencies (0.5-2.9 MHz); both methods have been used in treating various affections of soft tissues (3). Moreover, A. A. Goldstein has founded (1974) the International Academy for Radiosurgery (3).

Nowadays, radiosurgery (radio waves at 4 MHz) allows the heat control leading to cell vaporization and, in general setting, the right parameters letting the attaining of first-rate results.

The main purpose of this paper is to highlight the possibility to use RF in the surgical treatment of SBAPD in ambulatory, using only local anesthesia; at the same time, we have put into evidence the efficiency of RF within the above-mentioned conditions.

Material and Method

The study covers the period December 2003 – December 2014; all interventions took place in "Proctoline" – Bucharest on a number of 783 patients. The study followed the principles of medical ethics, according to Helsinki Declaration of World Medical Association, as well as the Oviedo Convention of European Union.

Criterion for inclusion in the present study: SBAPD that cannot be cured only under conservative (medications, hygiene-and dietetics) treatment and accordingly implied a minimal-invasive intervention, using RF, under ambulatory conditions.

SBAPD categories included in the study are presented alongside with the subsequent RF procedure: the main data are shown in *Table 1*.

Criteria for exclusion from the study:

1. Holders of the old type unshielded cardiac stimulators (peacemakers); it is known that RF may produce electromagnetic interference. (3)
2. Patients having implanted cardiac defibrillators; RF may generate arrhythmia (3).
3. Patients with neglected or complex SBAPD (i.e. inter-

Table 1. *Various types of SBAPD, included in the present study and the corresponding RF interventions*

Surgical benign ano-perianal diseases (10) treated with RF, detailing the intervention type			
Type of SBAPD	**Type of intervention using RF**	**Number of interventions (783)**	**Percentage of interventions (100%)**
1. Anal fissure	Curettage	265	33,84 %
2. Skin tag	Excision	181	23,12%
3. Perianal fistula (subcutaneous and/or low inter-sphincter / trans-sphincter fistula)	Fistulotomy or fistulectomy	100	12,77%
4. External haemorrhoidal thrombosis	Thrombectomy	48	6,13%
5. Superficial and marginal ano-rectal abscess (subcutaneous, low intersphincteric)	Excision	44	5,62%
6. . Benign ano-rectal polyp (fibroepithelial)	Polypectomy	41	5,24%
7. Granulation in ano-rectal tissue (subsequent to "classical" surgery)	Excision and/or curettage	37	4,73%
8. Benign anorectal tumor (hypertrophic anal papilla, lipoma, papilloma etc.)	Excision	35	4,47%
9. Perianal and/or ano-rectal condyloma (benign pseudo-tumor) - HPV	Excision and/or curettage	17	2,17%
10. Externally swollen hemorrhoids (varicose)	Excision	15	1,91%

Table 2. *Particularities of the group studied and the existing predispositions factors*

Group studied	**Sex**		**Origin**		**Noxious factors – existing predispositions to patients included in study**				
	F	**M**	**Rural**	**Urban**	**Smokers**	**Excess of alcohol**	**Excess of piquant food**	**Sedentary life**	**Troubles in intestinal transit**
783 patients	333	450	62	721	218	82	462	671	500
100%	42,53%	57,47%	7,92%	92,08%	27.84%	10,47%	59%	85,70%	63,86%

nal hemorrhoids of 4th degree, complex perianal fistulas etc) or severe local complications.

4. Pre-cancerous proctologic lesions (dysplasia) or malign tumors.

The particularities of the group and its peculiarities are presented in *Table 2*; also, we have identified the existing predispositions factors, generally favoring SBAPD.

Patients treated with RF surgery had 19 to 82 years old, the average age was 46 years.

The following data have been examined: clinical observation sheets; proctological examination; paraclinic investigations (videoanoscopy, EDI, trans-anal and abdominal ultrasonography; sometimes EDS, CT or IRM; surgical protocols; hystopathological results).

The main recorded data were: intervention type and duration; operative complications; postoperative evolution; medical leave – days; healing interval; the treatment efficiency in time (1 – 11 years) and recurrences. All interventions were performed using two radio-cautery pencil at 3.8-4.0 MHz, namely, "Surgitron-F.F.P.F.EMC" from "ELLMAN" (see *Fig. 1*)



Figure 1. *Radio-cautery "Surgitron-F.F.P.F.EMC" from "ELLMAN"(SUA) and its components: "Stan" mono-polar clip (RO) and "ELLMAN" electrodes for radiosurgery*



Figure 2. *Radio-cautery "Kentamed" (BG) and its components*

and "Kentamed" (*Fig. 2*), respectively; all procedures were done under ambulatory conditions with local anesthesia (lidocaine - 1%).

The surgery team consisted in proctologic surgeon and medical assistant. Post-operatory clinical evaluation took place at 1 and 4 weeks; in selected cases every time is necessary.

Results

Time of surgical procedure has been in the range 5 to 45 minutes, while complete post-operatory healing took place between 7 and 45 days. Occasionally, minor post-operatory have been needed, i.e. oral analgesics or anti-inflammatory ones (2-7 days), disinfectant baths (5-10 days), local applications of cicatrizing ointments (2-4 weeks) or dressings. In general, post-operatory complications were minor ones (see *Table 3*), in 8,3% of cases(65 patients).

The main reasons for postoperative complications are constipation, diarrhea, intense physical effort, alcohol, unsuitable feeding (especially the piquant food), stress, influence produced by other diseases like irritable bowel, acute HTA, post IMA, advanced DZ, viral B or C hepatitis, severe ones, compensated hepatic cirrhosis, cardiac prostheses, by-passes, post AVC, post-transplant i.e. kidney, liver status.

During the study, we did not record situations of post-operatory wound supra-infections, or anal incontinence. All operatory pieces have been submitted to histopathological examination, the results showing benignity in all cases. In addition, all patients benefitted from colonoscopy.

The following photos present selected SBAPD (already mentioned in *Table 1*) from the group. In this respect, we have presented the initial (preoperative) situation, images taken during interventions (intraoperative), photographs immediately post-operator (p/o), as well as postoperatory results after various times.

Table 3. *Post-operatory complications*

Complications	%	Patient number
1. Prolonged lymphorrhea (2-4 weeks)	2,68	21
2. Pronounced pain syndrome	2,29	18
3. Postoperative bleeding (more than just a dressing)	2,17	17
4.External hemorrhoid thrombosis (eradicated under conservative treatment)	1,66	13
5.Excessive granulation tissue	1,28	11
6. Recurrences	1,04	10
7. Intensive ano-perianal pruritus	0,64	5

Discussion

Despite a vast amount of data published in literature (7), a complete, methodical and comparative analysis regarding soft tissues treatment using various types of energies is not yet available.

Nowadays, beside RF, there are various options for surgical treatment of SBAPD: a) electrosurgery; b) cryosurgery; c) surgery using plasma; d) ultrasonic surgery; e) surgery using lasers (CO2,Nd-YAG etc.); f) infrared coagulation; g) last but not least - "classical" surgery.

RF presents some essential advantages (6) in comparison with other surgical methods in the treatment of SBAPD (8):

1. Incision and coagulation take place simultaneously.
2. The neighboring (lateral) tissue does not suffer important changes due to a reduced heat during intervention.
3. Hazard of post operatory infection is highly reduced, due to the sterilization effect. We have to mention that there are sterilization devices using RF.
4. Incisions may take place without pressure; this way, surgeries on very thin and/or mobile tissues become possible.
5. From the microscopic point of view, a wealthier neovascularization, as well as a delay of fibroblastic phase has been noticed; these facts are beneficial for a rapid and esthetic tissue recovery.
6. The artefact for biopsy is compressed (absorption 0.02 mm)

A study (9), using transmission electron microscopy (TEM), has shown different damages produced in neighboring tissues by the heat produced; these results mainly depend on the used medical technology and radiosurgery is the less

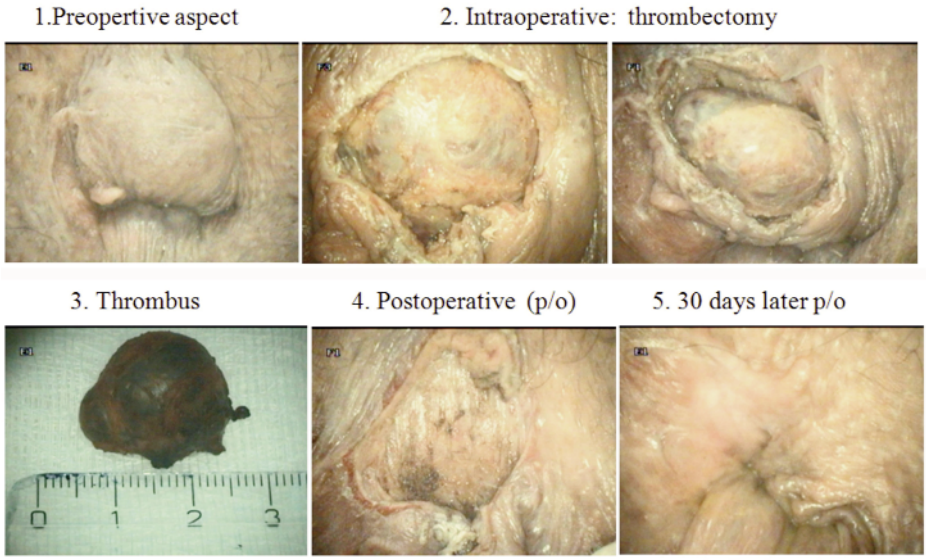


Figure 3. *External haemorrhoidal thrombosis - thrombectomy*

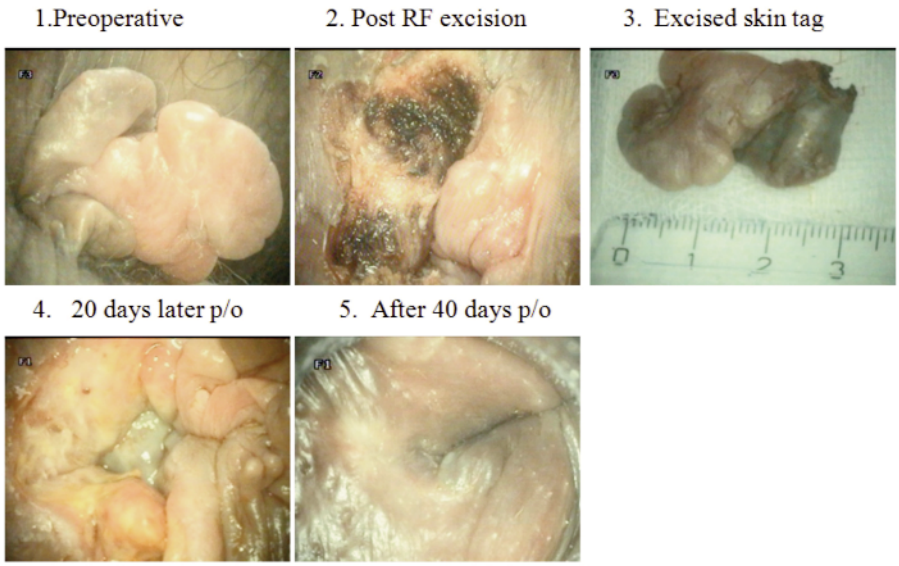


Figure 4. *Haemorrhoidal skin tag - excision with RF*



Figure 5. *Chronic anal fissure - curettage with RF*

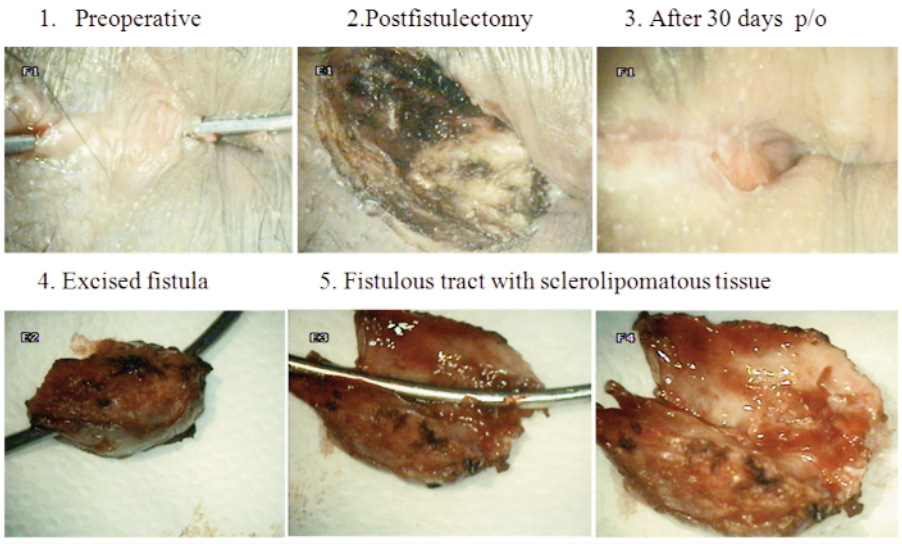


Figure 6. *Simple perianal fistula - fistulectomy with RF*

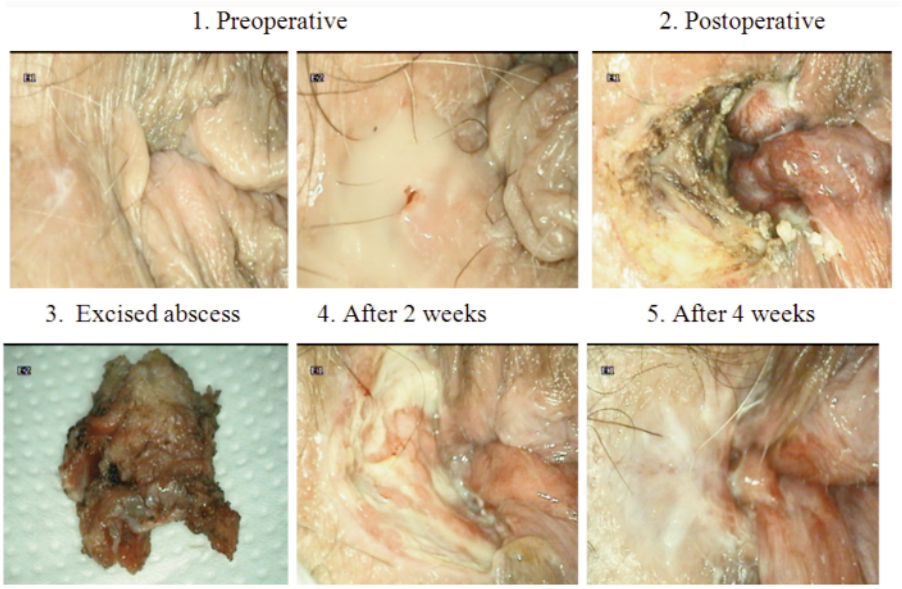


Figure 7. *Superficial and marginal ano-rectal abscess - excision with RF*

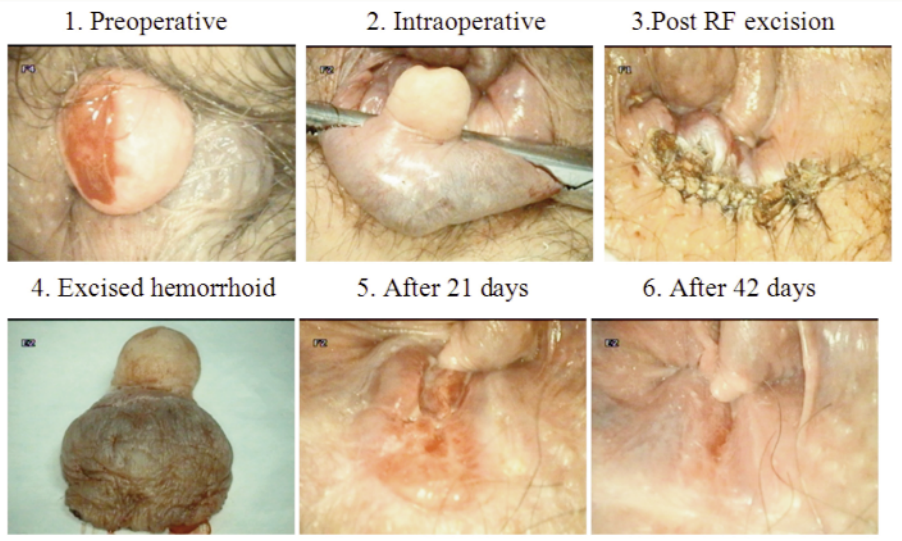


Figure 8. *External dilated (varicose) haemorrhoid with adjacent ulcerous anal papilla-excision with RF*

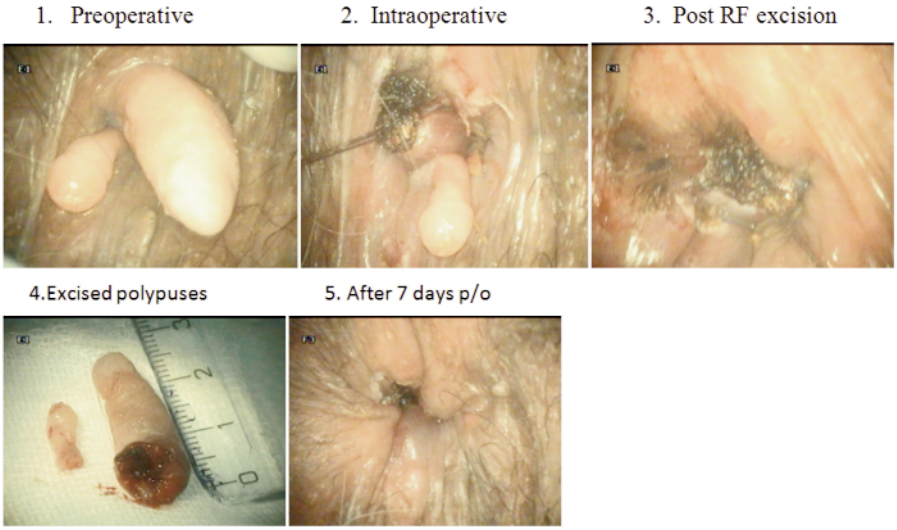


Figure 9. *Benign anal (fibroepithelial) polypus - excision with RF*

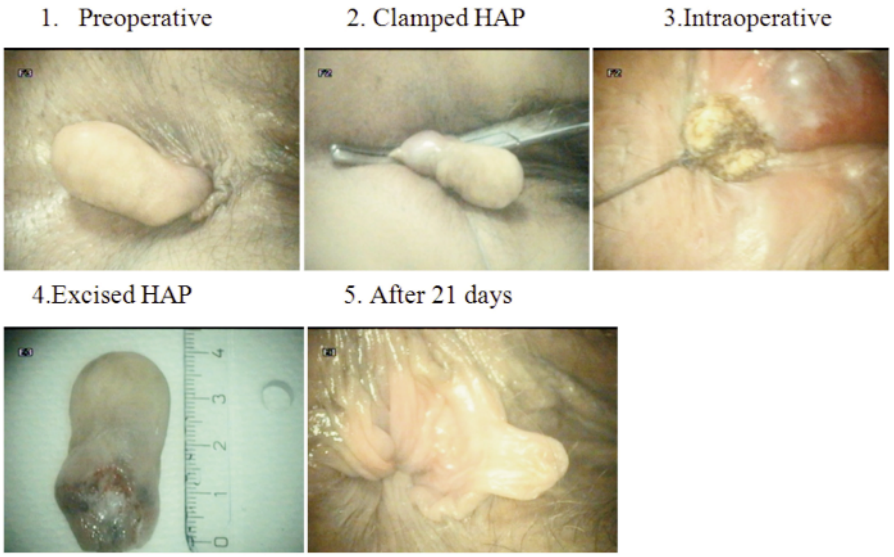


Figure 10. *Small benign ano-perianal tumor - hypertrophic anal papilla (HAP) - excision with RF*

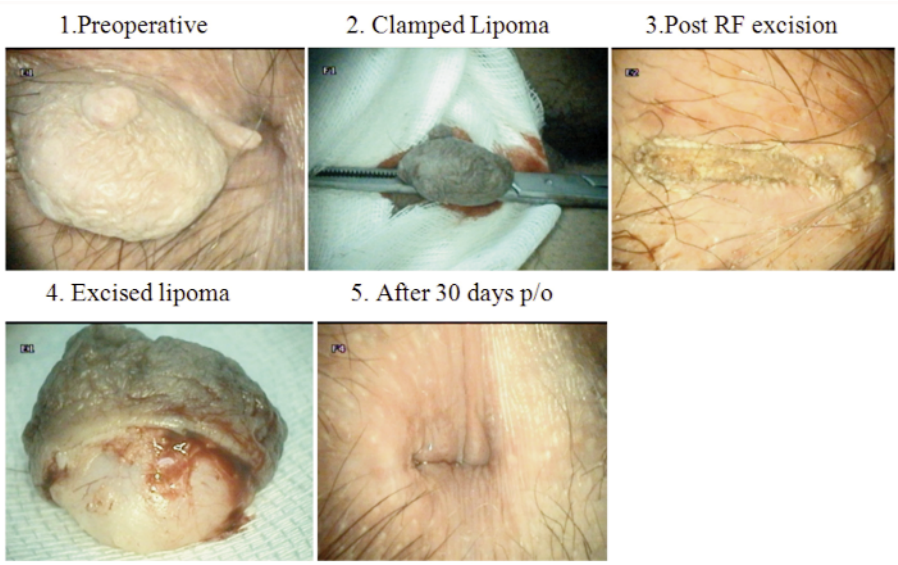


Figure 11. *Small benign ano-perianal tumor - lipoma - excision with RF*

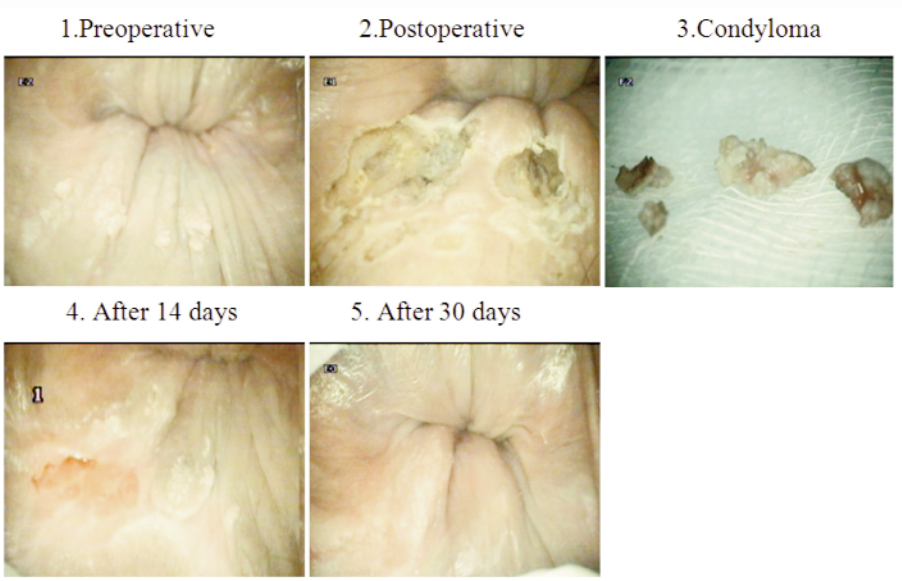


Figure 12. *Perianal condyloma acuminata (infection with HPV) - excision with RF*

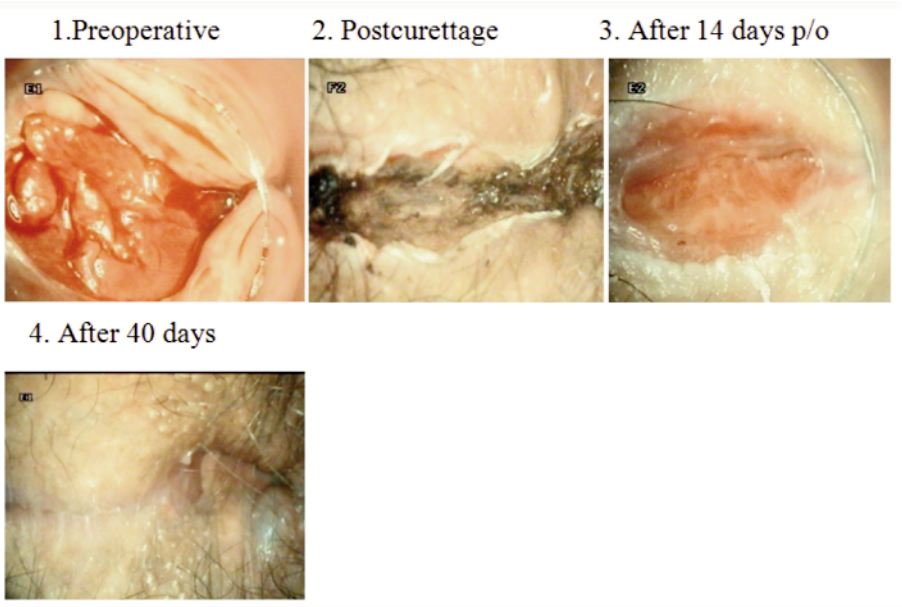


Figure 13. *Ano-perianal excessive granulation tissue after "classical" surgery for anal fissure - curettage with RF*

damaging procedure among electrosurgery or different type of laser (Laser KTP-532, laser Nd-YAG, laser CO2).

It has been noticed that high frequency (used in Ellman's radiosurgery) meets a lower tissue resistance; this way it produces a lower penetration when comparing with the low frequency (electrosurgery) and/or laser (9).

In this respect, another evaluation of RF (4 MHz) in comparison with other conventional surgery techniques used in proctology is illustrated in *Table 4* (10 – 19).

This fact might be understood as high radio frequencies (3.8 – 4.0 MHz) would generate less heat at tissue level. On the contrary, low frequencies (as used in electrosurgery) encounters a higher resistance, thus producing more heat in a greater depths. In turn, this circumstance would produce a higher damage/necrosis at cellular level on the incision lengths of course, collateral effects are edemas, pain, limphorea and a longer healing duration (20).

Among electromagnetic waves (EMW) used in surgery, RF implies a longer time than other EMW, with the purpose of generating heat in tissues. Numerous papers have shown that RF are the most efficient radiations(5).

Dr. P.G. Gupta and others, based on their practical knowledge withstand the advantages of using RF in the treatment of perianal fistulas, anal fissures, internal hemorrhoids or other SBAPA-s, in comparison with other surgical methods ofcure (21-25).

As known, radiosurgery may include monopolar or bipolar applications. We have to underline that the first RF interventions in the group studied, have been performed only in the monopolar conditions (with radiosurgical electrodes, later with

Table 4. *Advantages introduced by RF*

RADIOFREQUENCY 4,0 MHZ	**ELECTROSURGERY**
1. Incision and hemostasis take place simultaneously	1. For different interventions previous settings are required.
2. Minimal amount of smoke.	2. A large amount of smoke is eliminated.
3. Minimal damage of tissue	3. The tissue is damaged -similar effects as a third degree burn.
4. Rapid healing without scars.	4. Long healing period, usually with scars
RADIOFREQUENCY 4,0 MHZ	**CRIOSURGERY**
1. Interactions with tissue may be pre-set by selecting the suitable intensity	1. There is not enough precision; it is impossible to anticipate tissue damage.
2. No tissue burns, and neither unwanted adherences.	2. Very often the instrument sticks on the damaged zone – accordingly the tissue is torn off.
3. Edema development is minimal	3. Deep tissue damage and postoperative edema.
4. The results can be immediately noticed.	4. Uncertain results due to different response of the tissue.
RADIOFREQUENCY 4,0 MHZ	**LASER CO2**
1.Versatility.	1. Limited applicability in ano-rectal interventions.
2. Good results for both incisions and hemostasis.	2. Very efficient for incisions but not for coagulation.
3. Reasonable price; small maintenance costs.	3. High price; high maintenance costs.
4. Portable.	4. Limited mobility
5. Cheap treatment.	5.Very expensive treatments
6. Easy to use with proctoscopy.	6. Difficult to use with proctoscopy
RADIOFREQUENCY 4,0 MHZ	**INFRARED COAGULATION**
1.Many procedures allowing the treatment for hemorrhoids, polypus, fistulas etc	1. Only coagulation for incipient hemorrhoids is possible.
2. Incision, coagulation and fulguration are all possible.	2. The single method is photo-thermo-coagulation.

the monopolar „Stan" clip); subsequently, the more elaborate or difficult interventions (i.e. fistulectomy, excision of simple perianal abscesses, excision of external swollen hemorrhoids etc.) have been done with the bipolar clip, or both. The bipolar application allowed a significant decrease of intervention time that, in turn, determined a lessening of anesthetic (lidocaine). Moreover, when using the bipolar technique no suture threads were needed and the amount of lost blood is quite insignificant; our results have also been confirmed by other studies (5).

Nowadays, many surgical domains (general surgery – including the laparoscopic one, oncologic surgery, neurosurgery, gynecology, dermatology, esthetic surgery etc.) successfully use radiosurgery. As there are more and more medical energetic methods for tissues, and taking into account the availability of hybrid technologies, the surgeon has the thorny task to choose the most suitable method for his patient (7).

Conclusions

1. We may appreciate the position of proctologic radiosurgery as being a major one in the treatment of SBAPD; it can be successfully used in ambulatory, using only local anesthesia. Proctologic radiosurgery (PRS) represents a very efficient, rapid and safe method, introducing merely a minimal post-operatory discomfort and a tissue recovery, both rapid and esthetic with minor complications.
2. Under the conditions of modern society, treatment as outpatient is easy to be accepted, the versatility and the excellent results of this technique leads to a good compliance of the patients to surgical treatment.

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