Throwing light on radiofrequency and its uses

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The principle of radiosurgery is based on creating a low-power electric current without raising tissue temperature using a very high frequency generator (such as the CURIS® generator from Sutter). When a radio wave passes though biological tissue, it causes volatile tissue damage by ionising molecules of water leading to either a cut or coagulation depending on the way the wave signal is applied. This technique allows you to work more precisely with a clean cut and simultaneous coagulation, which leads to excellent results and reliable safety.

Introduction: The term radiofrequency is naturally derived from the primary use of the Megahertz range (radio). The freqency of the mains power supply (220v; 380v) is 50 Hz, for AM it is measured in several hundred KHz, for electrosurgery it is in the range of 300-600 KHz, for radiosurgery it is between 1 and 4 MHz and in a microwave oven it is around 2500 MHz.

Why would we want to increase frequency with an electric scalpel? The answer lies in the impedance of the human body; impedance (Z), namely, is defined by the resistance of a body in connection with the frequency of the current applied to it. From the biophysical point of view, the impedance of a living body is inversely proportional to the frequency of the current that runs through it. In other words, the warming effect on tissue due to its resistance decreases in relation to the increase in frequency (Fig. 1 and Fig. 2) since the heat induced around the electrode is between 40-90°C, while in electrosurgery and in the case of a C02 laser it always exceeds 100°C, which has been the cause of tissue carbonisation in the two techniques last-mentioned.

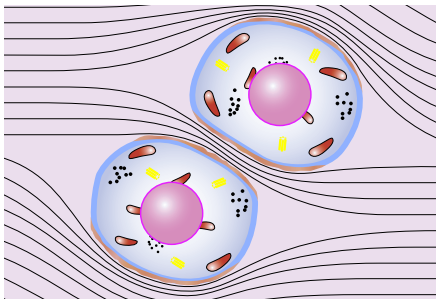

Fig. 1: Conventional electrosurgical units: The electromagentic field concentrates between the cells and heats up only the outer layer.

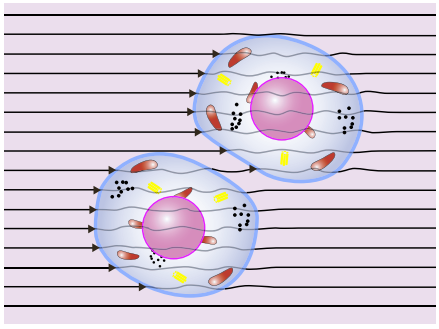

Fig. 2: CURIS® 4 MHz: Cell membranes are conductive and the energy is absorbed evenly inside the cells. The result are highly focussed tissue effects.

Increasing the generator frequency therefore makes it possible to decrease the heat released and the effect of carbonisation. Which leads to greater precision by limiting lateral heat, as illustrated by the following formula :

$$\text{Lateral heat} = \frac{(\text{Power})(\text{Time})(\text{Surface})}{\text{Frequency}}$$

This means that the effect of lateral heat decreases in proportion to the increase in the frequency of the current when the power of the latter increases or its time of application is prolonged or the treated area is enlarged.

What are the otorhinolyngological applications of radiofrequency (RF):

- RF velar treatment for lateral incision of the uvula
- RF turbinate treatment
- Treatment of cryptic tonsils
- Tonsillectomy using bipolar RF
- Volume reduction of the tongue base
- Phonosurgery
- Myringotomy (paracentesis, air-entraining)
- Skin surgery and plastic surgery

Fig. 3: To-BiTE™ (REF 70 09 60 SG), bipolar clamp

Presentation of a series of bipolar tonsillectomies using radiofrequency: We have been performing bipolar radiofrequency tonsillectomies thanks to the bipolar To-BiTE™ forceps developed with the CURIS® generator, which we have been using personally for several years and which provide ergonomics, comfort and reliability of use. This allows a precise grasp while performing incision and coagulation as well as aspiration, resulting in speed of execution with perfect control over the dissection plan. In our series, we operated on 150 patients between September 2006 and March 2009, all under general anaesthesia and with intubation. We experienced perfect control of peri-operative haemostasis in all cases. In two cases there was minimal unilateral haemorraging. The first post operative bleeding occured on the 8th day and the second on the 12th day after the operation. In both cases the occurrence happened at home and stopped spontaneously without any intervention. In the first case, the occurrence happened spontaneously while the patient was fast asleep, and in the second case when the patient ate a small piece of bread. Otherwise, we experienced a delayed reduction in the open wound in each case (12 to 15 days). In two cases there was dysphagia-type intense pain (compared to the cold method) on the second and third days following the operation that we attribute to poor technical execution. The dissection must have cut away muscle fibre, and it is for this reason that some authors recommend that dissection be performed using an operating microscope for more comfort.

Fig. 4: CURIS® radiofrequency unit (Sutter Medizintechnik GmbH/Germany)

Conclusion: Treatment using radiofrequency can systematically replace the classical scalpel. This can be of particular interest when it is necessary to achieve very precise incisions avoiding minor or major bleeding. This can be attributed to the fact that operative results are achieved without any form of tissue strain, pressure or retraction. A further advantage of radiofrequency is in the absolute sterility of the incision along the electrode's line of incision. Microorganisms cannot be transferred as they might in the case of a classical scalpel, which results in greater precision, conservation, safety and comfort.

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Featured Product

870060 – To-BiTE™ bipolar tonsillectomy set CURIS®

Qty.	REF	Description
1	700960 SG	To-BiTE™ bipolar tonsillectomy forceps, non-stick
1	370154 R	Bipolar (CURIS®) cable for To-BiTE™

870010 – CURIS® basic set with single-use patient plates

Qty.	REF	Description
1	360100-01	CURIS® radiofrequency generator (incl. mains cord, user manual and test protocol)
1	360110	Footswitch with two pedals for CURIS® (cut & coag), 4 m cable
1	370154 L	Bipolar cable for CURIS®, length 3 m
1	360704	Monopolar handpiece (pencil) cut & coag, shaft 2.4 mm, cable 3 m
1	360236	Cable for single-use patient plates, length 4.5 m
1 (x50)	360222	Safety patient plates, single use, packing 5 x 10 pcs. (not shown)

***Optional model**

CURIS® basic set with re-usable patient plate (REF 870020)

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