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The Use of Ceralas D50 in Endourology - A Preliminary Report

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Abstract

The 980 nm Ceralas D50 diode laser produces homogenous lesions on different tissues. We used the Ceralas D50 coupled with Comeg 21 or uretroscope-resectoscope 24 Ch laser resectoscope and we treated 3 uretero pelvic junction obstructions (UPJ) with hydronephrosis, 3 urethra stenosis, 4 multiple upper tract transitional cell carcinomas. Using the 1000 micron delivery fibers with different shaped tips, we obtained a bloodless sharp cut and easy vaporization with minimum carbonization, with power output in the range of 8-12 Watts.

Introduction

In laser surgery the source , the optical fiber, the handpiece or endoscopic instrument must be considered the basic elements of a system and must have specific properties in order to be adapted for clinical use. We started with a preliminary study of photobiology aimed at identifying the wavelength at which the ideal tissue absorption and power- cost ratio could be found. In the water transmission spectrum, ranging from 800-1100 nm, we identified a layer of quantum well of In0.2 Ga0.8As diode laser with emission at 980 nm, normally used for pumping erbium-doped optical amplifiers, as a source that could be useful for therapeutic application. At a wavelength of 980 nm, water radiation absorption was about 3 times as much as that at 1064 nm of Nd:YAG laser. This led us to presume that, once the water content of the body tissue is about 70 %, more than twice as much radiation could be absorbed by the tissue at the former wavelength than at the latter, and that the photothermal effects (coagulation, sterilization, vaporization) were also possible at that wavelength. In fact, the coefficient of transmission is about 95 % at the

wavelength of 810 nm at which the other diode lasers work, about 85 % at 1064 nm and 65 % at 980 nm [1-4].

Materials and Methods

Despite the use of laser in urology is matter of controversy, there are some areas in which lasers can greatly support. We tested the Ceralas D50 in 3 uretero pelvic junction obstruction (UPJ) with hydronephrosis, 4 multiple upper tract transitional cell carcinoma in a solitary kidney (MUTTCC) and 3 plurirecurrent urethra stricture (US). The Ceralas D50 is a continuous wave high power diode laser, able to give over 50 W at 980 nm, not requiring cooling, alignment mirrors and routine maintenance. It is a 15 kg of weight device, with a power supply that can be easily carried in different operating rooms. A 1000 nm tapered bare fiber was used. In UPJ obstruction we used percutaneous technique, changing the use of a cold hook and knife, with the fiber through a Comeg 24 ch laser resectoscope and/or Comeg 21 ch urethrotome. With power setting of 10 W, we were allowed to incise pelvis and proximal ureter and to coagulate vessels lining around UPJ up to 2 mm of diameter. Ureter was stented with 14-7 Ch DJ for 45 days after the procedure. Saline was used with lower postoperative retroperitoneal tenderness. In MUTTCC (lumbar and pelvic ureter) through a 9.5 Storz ureteropieloscope a 10 W power setting with energy pulsed 1 sec on, 1 sec off, was used. Complete resection of the tumors base, with possibility of pathology and subsequent coagulation of the residual tissue was achieved. In relapsing US with a Comeg 21 urethrotome we incised at 6 o'clock, instead of 12 as commonly done in old urethrotomy. Laser beam at 10 W provided an optimum coagulation of the corpus spongiosum with minimum bleeding during and after the procedure.

Results

In the 3 UPJ obstruction cases we noticed a very low or absent bleeding from the cut in the pelvis and ureter and very low postoperative abdominal and flank tenderness because of the use of saline during the procedure; at 3 months control all cases had a reduction of pelvic dilatation at sonogram and a good response to furosemide renography. Wee were able to eradicate all MUTTCC and spontaneous urinary cytology at 3 months were negative. In the 3 US cases the Ceralas D50 Diode laser allowed us to perform a good incision of the stenotic urethra a 6 o'clock without bleeding; a good urinary channel was made and after catheter withdrawal between the 3rd-5th postoperative day a normal urinary flow was restored, without bleeding and/or evident urethral diverticula; 3 months uroflowmetry showed a pretty normal pattern.

Discussion and Conclusions

Laser at 980 nm produce a minimum tissue edema, with minimum residual effect of carbonization and a sharp bloodless cut. The Ceralas D represents a good compromise between absorption and coagulative effects on the tissue with the possibility of modulating the photothermal effects. Therefore, small 980 nm diode laser sources with a maximum power of less than 25 W, with very low dimension and cost, could replace

laser sources of older conception. In conclusion diode lasers of 980 nm can be safely used in clinical application with same advantages over traditional Nd:YAG sources and other diode lasers of different wavelengths. Our preliminary report confirms the operative possibilities of the source, but we underline the need of consider the endoscopic instrument, the laser fiber and the laser source as an homogenous system that needs a joint and combined project.

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