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Diodi-L.A.S.E.R. assisted tonsillar reduction our experience

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Abstract: **The Authors describes their experience of diodi-L.A.S.E.R. assisted tonsillar reduction in pediatric patients. They show 261 cases of adenoidectomy and tonsillar reduction and discuss on clinical indications of this tecnique.**

Keywords: **Diodi - L.A.S.E.R, tonsillar reduction, adenoidectomy.**

I. INTRODUCTION

The use of various types of L.A.S.E.R. in otorhinolaryngology surgery has been providing significant advantages in complex applications for many years. The diodi-L.A.S.E.R. is a semiconductors L.A.S.E.R. that allows to obtain

an emission with a characteristic wavelength, which can be carried out through an optical fiber, connected to appropriate handpieces or endoscopic devices, supplied with the purpose of conveying the ray in various districts.

The advantages of this technology include the lower cost of the source compared to other types of LASER, reduced consumption, the dimensions provided and a simpler and cheaper management and maintenance system (1) (9) (10) (11) (11). In the present work is described the technique of volumetric reduction of the palatine tonsil by the use of diodi-L.A.S.E.R., limited to those cases in which, as there are no recurrent tonsillar inflammatory episodes, the indication for the surgical act on the palatine tonsil is only mechanical, due to the hyperplasia of the tonsillar tissue, conditions of use in pediatric age.

II. PATIENTS, MATERIALS AND METHODS

In the present study, 261 pediatric patients subjected in the period from 01/06/2006 to 31/08/2019 to adenoidectomy surgery associated with volume reduction of the palatine tonsil (tonsilloplasty) with diode-LASER are included.

The patients, of whom 134 were females and 127 were males, had an average age between 3 and 11 years, with an average age of 6 years and 10 months. They all came to surgery for rhino-oro-pharyngeal obstructive respiratory problems associated with phlogistic episodes of the upper airways and middle ear without however the number and quality of febrile episodes of tonsillar origin, were such as to judge the tonsillectomy, so it was decided to opt for adenoidectomy associated with the volumetric reduction of tonsillar tissue with diode LASER. The equipment we use is a Quanta L808 diode LASER capable of delivering, with powers up to 30 watts, a wavelength range of 980 nanometers; the application was carried out with fiber optic L.A.S.E.R. from 600 nanometers with a power of 6 watts continuously using a suitable handpiece equipped with a suction channel or, alternatively, using an external suction performed by the second operator. Patients were subjected to general anesthesia with oro-tracheal intubation; performed adenoidectomy, the tonsilloplasty was performed by administering about 20 spots lasting 10 seconds in the tonsillar parenchyma at about 5 millimeters deep from the external tonsillar surface, taking care that between each entry point of the fiber L.A.S.E.R. on the tonsillar surface there was a distance of at least 5 mm in order to leave enough healthy tissue to allow re-epithelialization.

Patients were routinely discharged the day after the surgical procedure and underwent ambulatory control at 7, 14 and 30 days. In about half of the patients (132) a follow-up was carried out at 1 year to assess the tonsillar situation at a distance, while in the remaining patients this follow-up is not available or due to the still too recent date of the intervention or because the patient for various reasons he did not appear at the checks over the thirtieth day after the operation.

III. RESULTS

The surgical procedure was always carried out without noteworthy complications; 26 patients out of 261 total presented a febrile increase of less than 38 ° C in the first 12 hours after surgery, then finished by the following morning, so as to allow discharge. There was no postoperative pain worthy of note at the tonsillar lodges; in cases where young patients reported mild tonsillar pain or ear pain, a dose of paracetamol was sufficient to control the symptoms. There were no immediate or late haemorrhagic manifestations at the fall of the eschars.

At the seventh day check-up, the tonsil was still covered by a patina of fibrinous exudate, which no longer appeared at the second check in day fourteen. One month after surgery, the tonsillar surface was perfectly re-epithelialized and of normal appearance, with a reduction in the volume of the palatine tonsil in its total estimated between 10% and 25% depending on the case. In 132 patients, follow-up is available one year after surgery. In 118 of these (89.3%) the situation was unchanged or improved compared to the previous control, therefore it could be estimated that the volumetric reduction of the tonsil associated with adenoidectomy had been sufficient surgery to solve the mechanical-obstructive problems of patients who did not present problems tonsillar inflammatory diseases such as to require other surgical treatments. In 14 cases (10.6%) the volumetric reduction obtained did not appear sufficient and the patients still suffered from obstructive apneas and dysphagic manifestations which, in one case, given the repeated intercurrent tonsillar inflammations, could be considered worse than the preoperative situation. In these cases, although the repetition of the treatment is conceptually feasible in order to obtain with more sessions the desirable tonsillar reduction, it was decided without hesitation for the tonsillectomy in consideration of the fact that the patients' age made it impossible to carry out the procedure under local anesthesia and therefore the alternative of the LASER tonsilloplasty in several sessions did not seem opportune, which, although more conservative and less risky in itself, exposed young patients to the risk of repeated general anesthesia. Our attitude is different in adult patients, not included in the present study, where the procedure is carried out almost exclusively under local anesthesia and in an outpatient or day-hopital procedure.

IV. CONSIDERATIONS

Amato et al. described in 1996 the effect of LASER on living tissues, with particular regard to the NdYag LASER, but many considerations can be reported to the action of the diode-LASER. (1) (2) (11)

The effect of L.A.S.E.R. on fabrics it is mainly thermal, so the heat that develops at the point of impact of the beam increases the temperature, triggering the vaporization of the tissue water once it reaches 100 ° C, with an effect that is a function of the power of the ray LASER in Watt, of the radiated surface and of the exposure time. The LASER ray induces in the tissue histological alterations characterized by concentric areas of carbonization, necrosis and edema. The area on which the LASER beam acted is macroscopically crater-shaped, marked by a carbonization edge and a large whitish outer halo; microscopically the verifiable alterations go, in the centrifugal direction, from the cellular necrosis with thermal coagulation of the proteins and the collagen stroma, to the thickening of the nuclei with their parallel arrangement, to the intercellular edema without stromal alterations. After 24 hours, the whitish exudate is created, generated by an inflammatory reaction with extravasation of red blood cells and leukocyte diapedesis and subsequent fibroblastic proliferation. Three weeks after the application of the LASER beam there is a total re-epithelialization with tissue retraction. Unlike the CO2 LASER, which is absorbed by water, and similarly to the NdYag LASER, the diode LASER is selectively absorbed by the hemoglobin, so, while the tissue action of the CO2 LASER is mainly vaporization, the action of the LASER diodes is purely coagulation.

The use of diode LASER in hypertrophic VADS pathologies, namely hypertrophy of the inferior turbinates and adenoid hypertrophy, has already been extensively tested by various authors. (1) (3) (4) (4) (5) (6).

V. CONCLUSION

Our experience demonstrates the applicability of diode-L.A.S.E.R. in simple tonsillar hyperplasia, that is not related to a procession of phlogistic facts but only to mechanical-obstructive problems such as sleep apnea, roncopathy, dysphagia and similar problems (7) (8). The method is simple, fast and free from risks and complications. In adult patients, not included in the present study, it is practicable in topical anesthesia in outpatient or day-surgery and, consequently, easily

repeatable in several sessions. In pediatric patients, who are more frequently affected by tonsillar hypertrophy often in association with adenoid hypertrophy, general anesthesia is necessary for oro-tracheal intubation which makes the repeatability of the method difficult for several sessions. We certainly do not believe that this method constitutes an absolute alternative to tonsillectomy, which, despite the risks related to it, but minimized by a correct pre-intra- and post-operative management, must be performed without hesitation if there are absolute indications. However, there is a not inconsiderable number of cases in which the indication for tonsillectomy is not absolute, or there are some contraindications relating to this surgical procedure and the pediatric patient is taken to the operating bed to undergo adenoidectomy; in these cases in which there is no history of recurrent tonsillitis significant in number and intensity, in which the objective aspect of the palatine tonsil is due to simple hyperplasia not associated with chronic phlogosis and not determining severe obstruction of the oropharyngeal cavity, the association of tonsillectomy adenoidectomy can be considered an over-treatment while abstaining from any surgical treatment on the palatine tonsil limiting itself to adenoidectomy alone can leave a significant part of the obstructive symptom unresolved. In this not negligible percentage of borderline cases, the use of the diode-L.A.S.E.R. for the volumetric reduction of the palatine tonsil (tonsilloplasty L.A.S.E.R.) undoubtedly represents a valid surgical alternative to keep in mind for its simplicity, absence of risks and effectiveness.

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