

Diode Laser Assisted Hypospadias Repair

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Abstract

Surgeons used to feel cumbersome with skin bleeding while making surgical incisions using scalpel. Even though we are traditionally using scalpel for skin incisions, incisions made using electromagnetic radiation of high frequency in the form of laser are considered to be of more cosmetic value, less time taking, less bleeding, less post-operative pain, no ill effects on wound healing.

Key words: Diode Laser; Hypospadias; Snodgrass Repair.

Introduction

Skin bleeding is a common problem after starting surgery. A continuous skin bleeding may obscure the operating field, and the surgeon feels discomfort, number of gauze pieces, suture material, and precious operating time is also wasted. The usage of laser decreases skin bleeding and total operative time also shortens.

The first laser was introduced by Maiman in 1960 [1], who used ruby to make laser. After a while, CO₂ (Carbon Dioxide) Laser and Neodymium Doped Yttrium Aluminium Garnet (Nd: YAG) lasers were developed. In medical field, laser was first used for photocoagulation of retina in 1960 [2].

Today, there are different types of lasers available for use: CO₂, Nd: YAG, Holmium Yttrium Aluminium Garnet (Ho: YAG), (Erbium, Chromium doped Yttrium Scandium Gallium Garnet) Er,Cr: YSGG, Neodymium doped Yttrium Aluminium Perovskite (Nd: YAP), Gallium arsenide (GaAs) (diode), and Argon [3].

In comparison with conventional scalpel, laser has many benefits, such as ease of soft tissue ablation, hemostasis [4], instant sterilization, reduced bacteremia, little wound contraction, reduced edema, minimal scar, reduced mechanical trauma, less operative and post-operative pain [5-7].

Case Summary

The patient, a thirteen year old boy presented with a subcoronal hypospadias. Patient after evaluation underwent Snodgrass repair under general anesthesia.

Wavelength specific goggles were worn by the operating surgeon and persons in the operating room. Patient's eyes protected using the eye shield. Markings were made by the operating surgeon. Penile tourniquet applied and artificial erection created. Traction sutures placed. The skin incision was made using diode laser with a frequency of 850nm and 1.7W, instead of using scalpel. It was noticed that bleeding was minimal and the precious time under general anaesthesia was remarkably less. Dissection of glans wing and urethral plate done. Tubularization of urethral plate done. A 6F sialistic stent plate and incision closed in layers using 6.0 polyglactin.

Fig. 1: Preoperative photo of patient



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Fig. 2: Photo of diode laser console and probe**Fig. 3:** Intraop photo demonstrating laser being used for incision

The skin incision was closed with PDS 6.0 and this procedure had no deleterious effect on the skin and the wound healed adequately.

Discussion

One of the most widely used applications of lasers is soft tissue surgery and ablation of lesions. The advantages of laser application are relatively bloodless surgery, minimal swelling, scarring and coagulation, reduction in surgical time and less or no post-surgical pain. Also, the laser instantly disinfects the surgical wound as well as allowing a

Fig. 4: Post op photo

noncontact type of operative procedure and therefore no mechanical trauma to the tissue. Laser transmits energy to the cells causing warming, welding, coagulation, protein denaturation, drying, vaporization and carbonization.

The diode laser was introduced in dentistry and oral surgery in the mid-90s [6-8]. The diode laser devices have specifications such as relatively small size, portable and lower cost that attract the dental practitioners and oral surgeons for use in various surgical indications in comparison to other laser equipment. The pump source is an electrical current, the photons are produced by electric current and laser active medium is semiconductor. The diode lasers have been used in three

wavelengths 810,940 and 980nm in surgical treatments. Provided correct selection and application of diode lasers in soft tissue surgery, for example frenectomy, epulis, fissuratum, fibroma, facial pigmentation and vascular lesions, they are safety and useful.

In almost all researches the scientists declared the unique specialties of lasers and particularly diode lasers such as; sharp and definite cutting edge, hemostasis and coagulation after surgery in addition to small size and better maneuver during application, which makes this laser very effective and a useful alternative device in soft tissue surgery in comparison to other lasers types such as Carbon Dioxide Laser (CO₂) and erbium lasers.

The disadvantages reported in researches on diode laser application were somehow similar to other lasers, like, delayed repair which is prominent in larger lesions and charring tissue in smaller lesions compared to the application of conventional scalpel surgical procedures and laser plume in excision of exophytic lesions produced by human papilloma virus and may be creates similar lesions in upper respiratory tract of laser operator not high enough to do so. Laser induced wounds because of definite and clean wound, generally heal well compared to scalpel incisions. This is may be due to the minimal degree of wound contraction following laser irradiation which occurs through induction and formation of smaller number of myofibroblasts and collagen [11,12].

Conclusion

Our case demonstrated diode laser can be used in hypospadias surgery safely because of easy application, better coagulation with less bleeding, less operative time and no undesirable effects on wound healing.

References

1. Maiman TH. Stimulated optical radiation in ruby. *Nature*. 1960; 187: 493-4.
2. Mahajan A. Lasers in periodontics-a review. *Eur J Dent Med*. 2011; 3:1-11.
3. Bains VK, Gupta S, Bains R. Lasers in periodontics: An Overview. *J Oral Health Community Dent*. 2010; 4: 29-34.
4. Ishikawa I, Aoki A, Takasaki AA, Mizutani K, Sasaki KM, Izumi Y. Application of laser in periodontics: true innovation or myth? *Periodontol 2000*. 2009; 50: 90-126.
5. Cobb CM. Lasers in peroidontics:a review of the literature. *J Peridontol*. 2006; 77(4): 545-64.
6. Wigdor HA, Walsh JT Jr, Featherstone JDB, Virsuri SR, Fried D, Waldvogel JL. Lasers in dentistry. *Lasers Surg Med*. 1995; 16(2): 103-33.
7. Luomanen M, Meurman JH, Lehto VP. Extracellular matrix in healing co2 laser incision wound. *J Oral Pathol*. 1987; 16(6): 322-31.
8. Eliades A, Stavrianos C, Kokkas A, Kafas P, Nazaroglou I. 808 nm diode laser in oral surgery: A case report of laser removal of fibroma. *Res J Med Sci*. 2010; 4(3): 175-8.
9. Pick RM, Pecaro BC. Use of the CO2 laser in soft tissue dental surgery. *Lasers Surg Med*. 1987; 7:207-13.
10. Pecaro BC, Garehime WJ. The CO2 laser in oral and maxillofacial surgery. *J Oral Maxillofac Surg*.1983; 41: 725-8.
11. Chomette G, Auriol M, Labrousse F, Vaillant JM. [The effect of CO2 laser radiation on the morphological changes of mucocutaneous wound healing in oral surgery A histo-enzymologic and ultrastructural study] *Rev StomatolChirMaxillofac*. 1991; 92: 1-7.
12. Zeinoun T, Nammour S, Dourov N, Aftimos G, Luomanen M. Myofibroblasts in healing laser excision wounds. *Lasers Surg Med*. 2001; 28(1): 74-9.