

Use of Laser in Acrylic Cranioplasty

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Abstract

Introduction: incisions placed on the scalp cause continuous bleeding which obscures the surgeon's field. There are many ways to control such bleeding like application of Raney clips, scalp tourniquet or infiltration of adrenaline saline solution. Diode laser scalpel was first introduced for oral surgery due to its advantages of hemostasis and better wound healing. Here we describe our experience in a case where the diode laser scalpel was used to place the skin incision while performing an acrylic cranioplasty.

Keywords: Diode Laser; Hemostasis; Cranioplasty.

Introduction

Skin bleeding is a common problem after starting surgery especially in the scalp. Due to the rich vascular supply of the scalp, continuous bleeding occurs as soon as the incision is placed, obscuring the entire surgical field. Precious time under general anesthesia is wasted in trying to control the bleeding. The use of a diode laser scalpel overcomes this problem. The bleeding that occurs after the skin incision is reduced to a large extent enabling the operating surgeon to work quickly and more efficiently.

Many methods have been devised to decrease the bleeding that occurs from the skin edges in scalp surgeries. Application of Raney clips, scalp

tourniquets or infiltration of diluted adrenaline saline or tumescent solution into the scalp has been used [1,2].

The use of laser scalpel has many added advantages. When the incision is made, it easily ablates tissues and provides excellent hemostasis³. There is instant sterilization of the wounds with reduced bacteremia. Postoperatively, there is reduced edema, minimal wound contraction, minimal scarring and less postoperative pain [4-6].

Here we describe a case report of a patient who underwent laser assisted acrylic cranioplasty for a right frontotemperoparital calvarial defect.

Case Report

A 44 year old male patient presented to the plastic surgery OPD with history of right front temporal craniectomy done 2 years back for post traumatic extradural hematoma. Preoperative workup was done which included a magnetic resonance imaging (MRI) to rule out underlying abscess and a 3D Computed Tomography (CT) to visualize the calvarial defect. Based on the 3D CT images, a polymethylmethacrylate (PMMA) impression of the calvarial defect was fashioned which was sterilized and used in the cranioplasty.

Under general anesthesia, the patient was positioned with head elevation. The incision line was marked. An infiltration of diluted adrenaline saline 1:200000 solution was injected into the proposed incision line. Protective glasses were placed over the patient's eyes. The operating surgeon, assistants, anesthetist and the scrub nurse were also given protective glasses. The skin incision was made with

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a diode laser probe over the marked incision line (Figure1). The settings used were a frequency of 2.5 W and a frequency of 850 nm. Skin flap was raised over the defect (Figure 2). Pre designed Acrylic implant was placed in the defect and three point fixation was done with the skull bone by using mini plates and screws. It was noticed that the bleeding was very minimal. It was noticed that the time taken to complete the procedure and time under general anesthesia was reduced. Wound healed completely without complications and good contour of skull was achieved (Figure 3a and 3b).



Fig. 1: Photo of diode laser being used for skin incision



Fig. 2: photo showing scalp flap raised



Fig. 3a: Post op photo in frontal view



Fig. 3b: Post op photo in lateral view

Discussion

The first laser was introduced by Maiman in 1960 [7], who discovered its use in retinal photocoagulation in 1960. 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 Aluminum Perovskite (Nd: YAP), Gallium arsenide (GaAs) (diode), and Argon [8]. Laser transmits energy to the cells causing warming, welding, coagulation, protein denaturation, drying, vaporization and carbonization [9]. It is used widely in soft tissue surgery and ablation of lesions.

The diode laser was introduced into the field of dentistry and oral surgery in the mid 90s. The electric current is the pump source which produces photons which is conducted through a laser active medium. This laser works at three wavelengths 810, 940, 980 nm. It possesses many advantages like small size, ease of use with a relatively low cost when compared to other lasers which attracts its widespread use [9]. The diode laser has an added advantage of being conveyed through a fiber which serves as the working tip at the end of the hand piece. The use of flexible, length-adjustable optical fiber also enables efficacious irradiation [10].

One of the major problems when operating on the scalp is profuse bleeding that occurs as soon as the skin incision is made. Many methods have been tried to control this bleeding like the application of raney clips to the edges of the flap or application of a scalp tourniquet or the infiltration of tumescent anesthesia. The use of laser scalpel has many added advantages over the conventional methods and over the use of regular surgical scalpel. The small size and long flexible fibre makes the diode laser scalpel convenient

to use. There is a sharp and precise cutting edge which does not cause damage to surrounding structures like the hair shafts. There is excellent coagulation both intra as well as post operatively. There is reduced discomfort of the patient postoperatively with minimal postoperative pain. There is minimal wound contraction and scarring postoperatively leading to a better final cosmetic outcome.

Conclusion

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

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