Received: 2 March 2018 | Revised: 24 May 2018 | Accepted: 1 June 2018

DOI: 10.1002/ccr3.1658

CASE REPORT

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# Gingival augmentation by combination of laser and Acellular Dermal Matrix allograft in a patient with dystrophic form of epidermolysis bullosa: A case report

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**Key Clinical Message**

A patient suffering from epidermolysis bullosa with gingival recession and lack of attached gingiva of the mandibular anterior teeth. Treatment was performed to increase the amount of attached gingiva. An erbium laser was used and the site augmented with Acellular Dermal Matrix allograft to reduce the donor site surgical complications.

**KEYWORDS**

Acellular Dermal Matrix, biostimulation, epidermolysis bullosa, Er,Cr:YSGG laser, gingival allograft, gingival recession

## 1 | INTRODUCTION

The term "epidermolysis bullosa" describes a heterogenous group[1] of inherited blistering mucocutaneous disorders. Each has a specific defect in the attachment mechanisms of the epithelial cells, either to each other or to the underlying connective tissues. Depending on the defective mechanism of cellular cohesion, there are four broad categories of EB, namely: simplex, junctional, dystrophic, and Kindler syndrome.[2,3] The degree of severity can range from relatively mild to severe forms such as the dystrophic types and more severe forms such as junctional type. Specific mutations in the genes encoding keratin 5 and 14 have been identified as being responsible for most of the simplex types, whereas mutations in the genetic codes of laminin-332, type 17 collagen, or α6β4 integrin have been documented for the junctional types. Most of the dystrophic forms are caused by mutation in the genes responsible for type VII collagen production, with over 300 distinctly different mutations identified to date.[4] The term "epidermolysis bullosa aquisita" is an unrelated condition having an autoimmune (rather than genetic) origin.

The dystrophic forms of epidermolysis bullosa that are inherited in an autosomal dominant fashion are usually not life-threatening, although they may be disfiguring and result in significant morbidity. Electron microscopic examination reveals clefting below the lamina densa of the basement membrane in the dystrophic form.[5,6] The initial lesions, vesicles or bullae, are seen early in life and develop on areas exposed to low-grade, chronic trauma, such as the knuckles or knees. The bullae rupture, resulting in erosions or ulcerations that ultimately heal with scarring. In the process, appendages such as fingernails may be lost. The oral manifestations are typically mild with some gingival erythema and tenderness. Gingival recession and reduction in the depth of the buccal vestibule may be observed.[7] In the dystrophic form, vesicles and bullae form with even minor trauma. Secondary infections are often a problem because of the large surface areas that may be involved.[8,9] If the patient manages to survive into the second decade, then hand function is often greatly diminished because of the repeated episodes of cutaneous breakdown and healing with scarring, resulting in fusion of the fingers into a mitten-like deformity.

Severe oral problems are also found. Bulla and vesicle formation is induced by virtually any food with some degree of texture. Even with a soft diet, repeated cycles of scarring often result in microstomia and ankyloglossia.[10] Similar


**FIGURE 1** Patient's facial profiles and severe deformities of hands

mucosal injury and scarring may cause severe stricture of the esophagus. Because a soft diet is highly cariogenic, carious destruction of the dentition at an early age is common.[11]

Treatment of epidermolysis bullosa varies with the type. For milder cases, no treatment other than local wound care may be needed. Sterile drainage of larger blisters and the use of topical antibiotics are often indicated in these situations. For the more severe cases, intensive management with oral antibiotics may be necessary if cellulitis develops[12]; despite medical care, some patients die as a result of infectious complications. Injections for local anesthesia can usually be accomplished by depositing the anesthesia slowly and deeply within the tissues. For extensive dental care, endotracheal anesthesia may be performed without significant problems in most cases.

The use of lasers in dental soft and hard tissue treatment procedures is increasing. They have also demonstrated many benefits over conventional procedure such as biostimulatory effects and better wound healing, reduction in oral pathogens and more sterile treatments, less bleeding and pain.[13,14]

## 2 | CASE REPORT

A 31-year-old woman with dystrophic form of EB was referred to our department for gingival augmentation. Her chief complaint was "teeth brushing specially at the anterior teeth of lower jaw is painful" which impaired proper oral hygiene procedures. Two of her three siblings also suffered from DEB, although her parents were asymptomatic. Extraoral examination revealed scarring of her hands and feet (Figure 1D,E). Intraorally, caries, the accumulation of plaque and calculus as well as gingival recession, could be seen. The initial phase of periodontal treatment was performed, which included scaling and root planning (SRP) and instructions in personal plaque control with an ultrasoft toothbrush.

Notice many restorations, gingival recessions (Figure 2B,C), microstomia (Figure 2E), and erosions of the oral mucosa.

The patient returned after 3 weeks for surgical treatment. Dental plaque of the mandibular anterior teeth could still be observed due to the difficulty that the patient experienced in performing mechanical plaque control. In preparation for the surgery the patient rinsed for one minute with 0.12% chlorhexidine (CHX) mouth rinse to reduce the bacterial load. Local anesthesia (Lidocaine 1⁄100 000 epinephrine) were administered through deep and slow local infiltration. Er,Cr:YSGG laser with a setting of 2.75 W, 50 Hz, H mode (60 microsecond pulse duration) and 65% water, 20% air spray, and a MZ6 laser tip with 600 micron diameter (Figure 3) was used to incise and denude the gingival tissue as partial thickness. There was minimal bleeding in the area due to the ablative mechanism of action of this laser (Figure 4). After preparation of the recipient bed the exposed root surfaces were root planed carefully.

Acellular Dermal Matrix (ADM) allograft from Tissue Regeneration Corporation (TRC, CenoDerm, Iran) with the size of 10 × 20 mm and thickness of 1-1.4 mm was rehydrated for 20 minutes. Before placement of ADM, the recipient site was irrigated to remove any blood clots, as these may interfere with the healing process. The ADM was cut to size and sutured placed over the prepared site with 5-0 polyester single


**FIGURE 2** A, B, Gingival recession, shallow vestibular depth, and plaque accumulation could be seen. C,D, Escars and erosions of the oral mucosa

sutures. More atraumatic fixation was carried out by 5-0 polyester with Ochsenbein suturing technique (5-a). After fixation of the graft, slight pressure was applied with a moistened gauze to ensure close adaptation of the graft to the recipient bed and to eliminate dead space formation. Biostimulation was performed to stimulate wound healing with the Biolase-Epic10 (USA), and a laser setting of 940 nm, 0.2 W, 15 seconds, continuous wave, using a low-level handpiece in three areas of 1 $cm^2$, 3 $J/cm^2$ each, and a total of 9 $J/cm^2$ in the grafted area (Figure 5B).[15] The operation area was then covered by Coe-pak surgical dressing (Figure 5C).

Postoperatively, a combination of syrup metronidazole 250 mg and syrup amoxicillin 500 mg to be taken three times a day for 7 days was prescribed. The patient was provided with postoperative instructions that warned against manipulation of the surgical site. The surgical dressing and sutures were removed after 2 weeks, and the patient instructed in atraumatic plaque control techniques. The depth of vestibule had increased significantly and some root coverage was obtained (Figure 6A). Figure 6B demonstrates the results photograph after 6 months; the vestibular depth and root coverage had been maintained. Notice the increase about 10 mm in vestibular depth and some root coverage (Figure 6B). The patient was satisfied with the results as she could more effectively brush the area.

## 3 | DISCUSSION

Epidermolysis bullosa, specially in its dystrophic form, usually affects the oral cavity. Gingival recession,

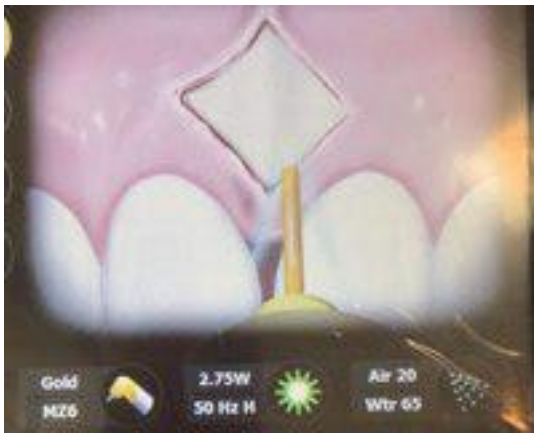


**FIGURE 3** Er,Cr:YSGG laser setting used for vestibuloplasty and preparation of the graft bed

vestibular depth reduction, mucosal erosions, and scar formations are common oral features. However, case reports about periodontal plastic surgery in patients with EB are rare. Brian et al[16] performed an autogenous connective tissue graft with a coronally positioned flap while,[17] used ADM as graft material to increase the amount of keratinized gingiva.

In the present case an Erbium laser was used to reduce the trauma of the surgical procedure, followed by biostimulation to improve healing. This has also been done in a previous study.[18]

The Er,Cr:YSGG laser has highly absorbed by water molecules in the tissue resulting in ablation of the tissue surface, this provides good incision without heating the deeper

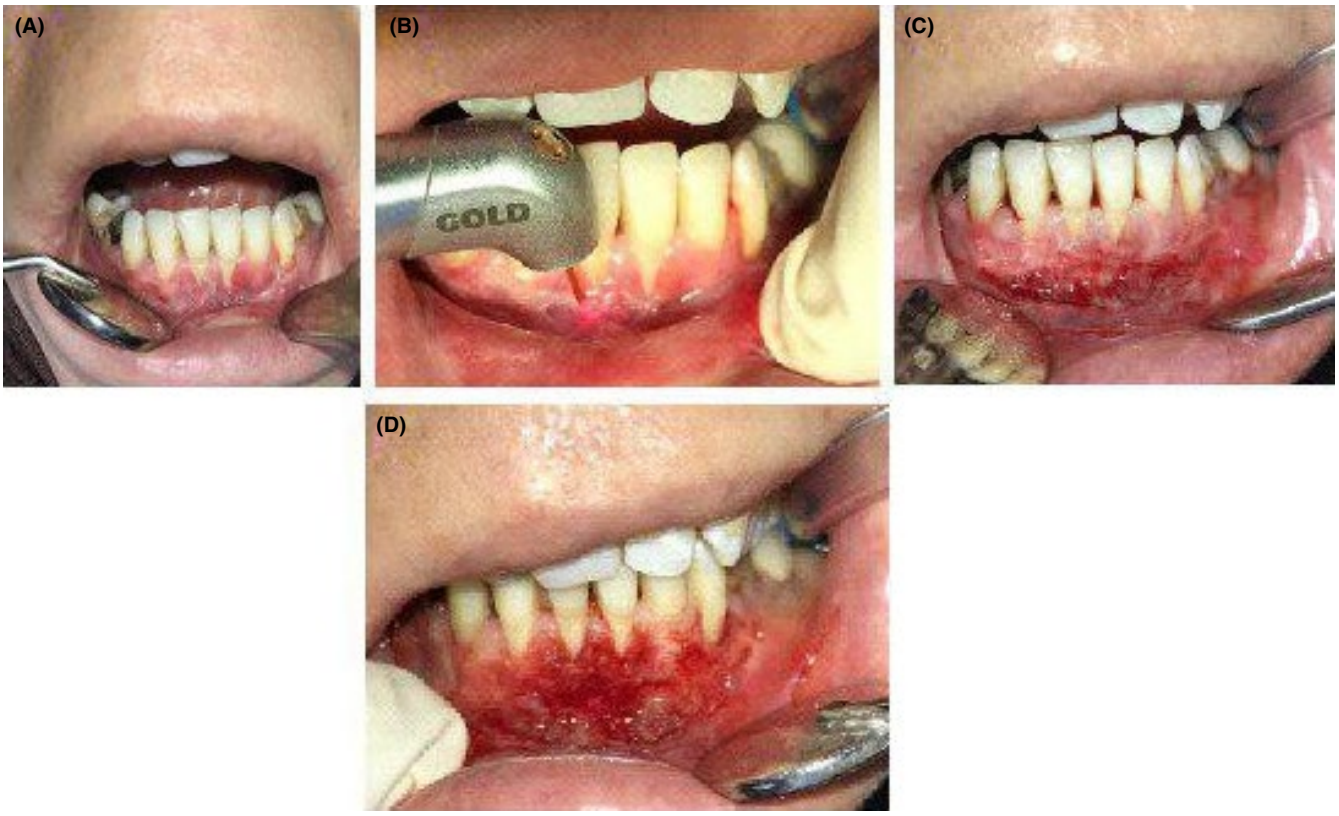


**FIGURE 4** Preparing the recipient site with the laser


**FIGURE 5** A, Grafting with ADM and suturing. B, Low-level laser therapy. C, Surgical dressing

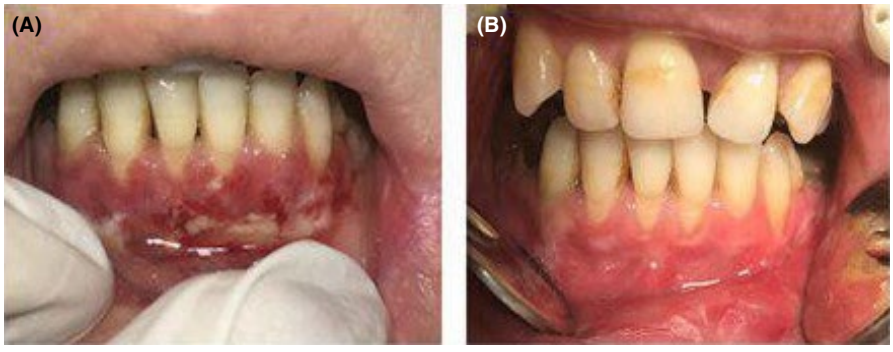


**FIGURE 6** A, Removal of suturing and surgical dressing after 2 weeks. B, After 6 months follow-up, notice appropriate vestibular depth and normal gingival color and texture

or surrounding tissues. We also reduced its coagulative effects using H mode (60 microsecond pulse duration) with shorter pulse duration. This creates higher peak powers and more ablative effects rather than coagulative. The energy is quickly absorbed in the soft tissue surface without heat and coagulative effects.[19,20] The water sprayed on the treated area also helped provide minimal coagulative effects. This was necessary to provide a good recipient bed for the graft.

Er;Cr:YSGG laser is shown to be a safe, minimally invasive device in previous studies. It has also been reported to result in fast and better wound healing without scaring.[21,22] In addition, a diode laser was used to provide biostimulation to the area. Biostimulation provides a photochemical effect through which light is absorbed to cause chemical changes in cells.[23-25] Diode lasers have been reported to stimulate cell proliferation via stimulation of mitochondrial respiration and ATP pathway, shift in overall cell redox potential in the direction of greater oxidation, and also changes in expression of several proteins related to epithelial proliferation and maturation in in vitro studies.

Biostimulation has resulted in increased healing outcomes in clinical studies.[22,26] and was also the subjective experience in this study. The postoperative results were maintained after 6 months; an increase in vestibular depth, appropriate thickness, gingival texture and color of the grafted tissue, as well as some root coverage were achieved. Most importantly, the patient was satisfied with the results and could perform optimal plaque control which should sustain the periodontal health of the area.

## 4 | CONCLUSION

The combined use of an erbium laser with ADM and biostimulation is a useful and less traumatic procedure, than a free gingival autograft in a patient with EB to increase the vestibular depth and gain attached gingiva.


## ACKNOWLEDGMENT

The authors have acknowledged the Department of Periodontology, School of Dentistry, Hamedan Medical Science University, Hamedan, Iran.


## CONFLICT OF INTEREST

There is no conflict of interest with regard to this article. No funding has been used other than that of the author's institution.

## AUTHORSHIP

LG: selected and managed the patient and edited the manuscript. OT: managed the patient, drafted the manuscript, and is the corresponding author.


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**How to cite this article:** Gholami L, Taherpour O. Gingival augmentation by combination of laser and Acellular Dermal Matrix allograft in a patient with dystrophic form of epidermolysis bullosa: A case report. *Clin Case Rep*. 2018;6:1571–1576. https://doi.org/10.1002/ccr3.1658