Management of Salter-Harris Type 2 Growth Plate Injury in Children with Low-Level Laser Therapy (LLLT)

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Citation

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Abstract

Introduction:

This clinical case series revealed successful management of Salter-Harris Type 2 growth plate injury at distal radius with LLLT achieving bone healing and correction of mal-alignment without casting

Materials & Methods:

This represents a prospective clinical case series of 6 children all suffering Salter-Harris Type 2 injury after slip and fall injury. LLLT was administered on alternate days emitting from GaAIAs semi-conductor laser of 810 nm wavelength. Serial x-rays were checked, clinical followed up for 2 years to assess bone length

Results:

All 6 children had good bone healing and the angulated bony fragments were corrected without the need of open or close reduction. Long term 2 year follow up revealed pain-free upper extremity while the bone length was equal to the contralateral upper extremity

Conclusion:

LLLT if administered properly can be used as conservative treatment of Salter-Harris Type 2 injury in children

INTRODUCTION

It has previously been reported by the author that pediatric angulated distal radius fracture can be managed non-operatively by LLLT [1] in this journal. The present clinical case series of six children all have Salter-Harris Type II growth plate injury whose parents refused casting as there were concomitant forearm wounds and all treated solely with LLLT treatment for 8 weeks together with a plastic resting splint. Many small children are understandably apprehensive of close reduction or surgical intervention. The clinical efficacy of LLLT in tackling these problems without the need of close reduction, nor complete casting would proof to be rewarding in reducing the suffering of these small children.

MATERIALS AND METHODS

The study period spans from 2015 to 2020, consisting of patients attending 3 clinics namely wellness pain centre, Asia medical pain centre, and digital pain centre. The male:female ratio was 5:1 and the mean age was 8 (range 7 to 9). All the parents refused complete casting and consented for LLLT treatment spanning 8 weeks. LLLT was provided by a GaAIAs semiconductor device emitting 810 nm wavelength, 5.4 J per point, and power density of 20 mW/cm2 was used and the duration of application of LLLT over the fracture site was 360 seconds administered on alternate daily basis to the fracture site, without the use of

other oral medications. Skin wounds have their dressing changed during each clinic visit. All fractures occurred at the distal radius in this study, the right distal radius was affected in 5 out of 6 cases.

Serial radiographs were taken every week to assess the degree of bone healing if any. No other physiotherapy treatments were administered other than FDA approved LLLT devices. The use of control by sham light source was objected by the majority of subjects and thus sham light irradiation was not employed. All patients had minimum follow up of 2 years to assess the long-term clinical results in terms of pain level, deformity if any, and the bone length of the affected bone over time compared with the contralateral side.

RESULTS

All subjects completed the LLLT treatment of 8 weeks without side effects. Treatment failure is defined by failure to obtain radiological bone healing that necessitated open or close reduction. In this study, there were no defaulters, and 6 out of 6 subjects demonstrated good bony responses to LLLT. Fig 1 illustrates a typical patient with Salter-Harris Type 2 growth plate injury with some displacement of the bony fragment. Fig 2 illustrates the typical response at 8 weeks with total correction of bony alignment by LLLT besides good bone healing.

At the 2 year follow up mark, there was no pain in all patients, and equal bone length in both radius as well as no bony deformity on serial follow up.

Figure 1

Figure 2

DISCUSSION

Physeal injury can cause damage to the growing cells resulting in growth disturbance, thus forming the rationale of the need of long-term follow up in this study. The growth plate of children tends to be more susceptible to injury during periods of rapid growth [2]

The author had previously reported in a book publication [3] that LLLT can augment the healing of human upper and lower extremity fractures. The result of this study highlights the fact that LLLT can be used to enhance bony healing even in bony injury around the growth plate in children. To stress yet again, LLLT can enhance bony healing by various mechanisms including an increase in BMP2-induced phosphorylation of the Smad 1/5/8 pathway [4] as well as stimulate BMPs-induced expression of type 1 collagen, osteonectin, and osteocalcin mRNA [5] besides improving bone mineralization [6].

CONCLUSION

The administration of low-level laser therapy for 8 weeks was shown to be effective in enhancing bony healing of the metaphyseal bone fragment in Salter-Harris Type 2 growth plate injury in children. LLLT was also demonstrated to remodel and correct the mal-alignment without the need of attempted close reduction. Finally, long-term follow up shows no effect on the bone length after application of LLLT, and with very satisfactory long term clinical result with no pain, nor deformity and full function in all patients.

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