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Original Article

Neglected post burns contracture of hand in children: Analysis of contributory socio-cultural factors and the impact of neglect on outcome[☆]

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ABSTRACT

Background: No study has ever evaluated the causes and effect of neglect on the outcome of post burns contractures of hand in children.

Methods: 66 hands in 61 children (mean age 12.22 years) with a mean neglect of 11.6 years (range 5–17 years) were assessed for the causes of neglect and the outcome of surgery. Average follow up was 6.6 years. The results were assessed in two groups of 5–10 years neglect as group I and >10 years neglect as group II.

Results: In a total number of 134 contracted rays in 66 hands, the surgical procedures included local Z/V-Y flap (51 rays), cross finger flap (48 rays), full thickness graft (35 rays). Additional external fixator with a distractor was used in 3 patients treated at a delay of 14, 16 and 17 years.

50 (81.96%) patients belonged to rural and slum areas. The reasons for delayed treatment included poverty – 33 patients, lack of awareness of surgical treatment – 16 patients; and indifference of parents – 12 patients. 44 (72.13%) children were illiterates. With treatment the average DASH score improved from 65.10 to 36.90 ($p < .000$) and from 68.14 to 45.93 ($p < .000$) in group I and II respectively. The results were significantly superior in group I ($p < .000$).

Conclusion: The main factors for neglect in treatment of post burns contracture include poverty, lack of awareness and illiteracy. All the patients showed significant improvement in function after the surgery. Contractures with higher neglect had significantly inferior outcome.

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1. Introduction

Hand is the commonest site to get inflicted with a burn injury, with children being common victims.^{1–6} One of the major determinants of the quality of life in burn survivors is the functionality of the hands.^{7,8} These patients are likely to develop various hand deformities and contractures, preventing full hand function.^{9,10}

The problems encountered in the treatment of neglected burn contracture include shortage of skin, secondary changes in surrounding tissues like tendons, neurovascular structures, bones and joints and other soft tissues.^{11,12} Neglected post-burn contracture is a common problem in the developing countries.¹³ There is no scientific data which has tried to assess the causes of neglect in these cases. A number of interplaying factors like poverty, illiteracy, scarcity of specialized surgical centers especially in rural areas, lack of organized health insurance, lack of willingness on the part of the family to seek treatment are likely to act in delaying the appropriate treatment. Knowledge of the role of these factors individually or in combination will help the health care planners to formulate effective strategies for prevention and timely treatment. Furthermore, the effect of delay/neglect in the outcome of surgical treatment has never been investigated.

We present our experience of treating a series of neglected post burn contracture cases in the last 15 years with a focus on the study of socio-cultural factors leading to delay in treatment, and the relationship of neglect/delay in treatment with the functional outcome.

2. Patients and methods

Children with neglected post burn contractures operated from June 1995 to June 2010 were included in the study. Only the patients reporting with a minimum delay of 5 years after the initial burn injury were taken as neglected cases. Patients with burn contracture of less than 5 years duration and with a follow up of less than 2 years were not included in the study. 66 hands in 61 children with post burn contractures fulfilled the inclusion criteria and were included in the series.

At the time of first visit, patient was asked to fill a questionnaire seeking the socio-cultural issues related to the causation and management of the contractures. A clinical photograph of the hand was taken. X-rays (AP and Lateral views) of the affected hand/finger were done in all the cases. Hand function was documented by using a modified DASH score.¹⁴ All the patients were operated under general anesthesia under a tourniquet control. Post operatively a plaster slab was given to all the patients for 2–3 weeks, after which hand physiotherapy was started. At the final follow-up, the hand was photographed and hand function was assessed by using the modified DASH score.

For knowing the effect of quantum of delay in the treatment, the patients were arbitrarily divided into two groups: Group I – patients with a delay in treatment of 5–10 years; and Group II – patients with delay in treatment of >10 years.

Statistical analysis was carried out using SPSS version 19 (SPSS Inc., Chicago, Illinois); statistical significance was set with a *p*-value of 0.05.

3. Results

There were 31 (50.81%) males and 30 (49.19%) females having average age of 12.22 years (range 7–18 years); 35 children presented between age range of 11–14 years. Right hand was involved in 37 cases while dominant hand was involved in 41 cases. 4 fingers were involved in 6 hands, 3 fingers in 14 hands, 2 fingers in 22 hands, thumb in 7 hands and 1 finger in 17 hands (index finger – 8, middle finger – 3, ring finger – 3, and little finger – 3). 8 patients with electric burns had hypoesthesia. Average duration between burns and surgery was 11.6 years (range 5–17 years). Average age of infliction of burns was 4.5 years (range 1 month–8 years). Mode of burns was: electric burns – 29 cases, fire cracker burns – 17 cases, burns from dry heat (burning coal from earthen ovens) – 10 cases, wet heat (hot water/liquid burns) – 5 cases. Out of total number of 134 contracture of individual rays, local Z/V-Y flap was done in 51 rays, cross finger flap was done in 48 rays and full thickness graft was done in 35 (25 from ulnar border of palm, 8 from upper arm and 2 from inguinal region). Additional external fixator with a distracter was applied in 3 patients; all these patients were in Group 2 and came at 14, 16 and 17 years of delay.

Average follow-up was 6.6 years (range 2–15 years). 37 patients belonged to rural areas. Of the 24 urban patients, 13 came from slum colonies. Initial treatment of burns was taken from a local paramedic/quack by 20 patients, while 41 patients received treatment from local dispensary. The reason for delayed treatment included poverty – 33 patients, lack of awareness of surgical treatment – 16 patients; and indifference of parents – 12 patients. Of 61 children, 7 never went to school and 37 were drop outs.

Average pre-operative modified DASH score in group I was 65.10 and in group II was 68.14. Average post-operative score in group I was 36.90 and in group II was 45.93, with a statistically significant improvement noted in the two groups on paired *t*-test [*t* value = 31.364, *p* < .000; *t* value = 21.172, *p* < .000, respectively]. Also, a comparison of the results in the two groups showed a significantly better improvement in Group I compared to Group II on unpaired *t*-test [*t* value = –7.72, *p* < .000]. Photographs of a representative case with good clinical outcome are depicted in [Figs. 1 and 2](#).

Complications included delayed wound healing in 10 rays (all with full thickness graft), problem of hair growth in one ray (with full thickness graft from inguinal region) and Sudeck dystrophy in one patient with external fixator treated at a delay of 17 years. Two patients of electric burns developed partial epiphyseal injury resulting in angular deformity at the proximal interphalangeal (PIP) joint of right little finger in a thirteen years old female ([Fig. 3](#)) and bony ankylosis at the distal interphalangeal (DIP) joint of right ring finger in a 14 years old male ([Fig. 4](#)). Both the patients, however, did not opt for any corrective surgery for the bony deformities as there was no significant handicap in function.

Fig. 1 – Preoperative neglected contracture of the first ray in a 9 year old female sustained due to firecracker.

4. Discussion

The contractures of hand restrict motion and are functionally disabling.¹¹ Management of hand burn injuries in pediatric patients is a special problem as compared to adults because of the accentuation of the deformity due to rapid growth of hand and poor compliance of the child for rehabilitation.¹⁵

Loss of hand function following thermal injury depends on the extent of burn and the degree of scar formation during healing.¹¹ Once a contracture is established, there may be secondary changes in otherwise normal tissues so that there is an aggravation of the disability and correction becomes difficult.^{11,15,16}

Primary involvement of the bones and joints, or exposure of partly destroyed tendons, constitutes a rare but serious clinical form of deep thermal injuries to the hand.¹⁷ Two patients in our study with severe electric burn contractures developed bony deformities due to partial epiphyseal injury resulting in angular deformity of the PIP joint in a 12 years old female and bony ankylosis resulting in flexion deformity at

the DIP joint of the ring finger in a 14 years old male respectively (Figs. 1 and 2).

Average age of infliction of burns in our patients was 4.5 years (range 1 month–8 years). Younger kids have been reported to be the common victims of burned hands in developing countries.^{13,18,19} These young victims are not able to comprehend the hazardous nature of the inflicting agent, thus the responsibility for creation of a safe environment for them lies on the society and the government.

57.37% (35 of 61) patients in our series presented for treatment between 11 and 14 years of age. 25 of these 35 children (71.42%) attributed the reason for seeking treatment at this time to either inability to get a job, or payment of lower wages to these disabled children than their normal counterparts.

Reasons for delaying the treatment were poverty and illiteracy in 49 (80.33%) patients and indifference of parents in 12 (19.67%) patients. 81.96% patients (50/61) belonged to either rural or slum areas and all had a poor socio-economic background. 44 (72.13%) children either never went to school or were drop outs. These figures point out that improvement of

Fig. 2 – Immediate post operative and follow up function of the same patient.

socio-economic status and provisions of a good education will do a lot to safeguard against these disabling injuries. Additionally, provision of special schools/sections for such children is important so that the handicaps of such injuries are minimized. The knowledge of social factors and the

appropriate measures concurrent with the local culture and beliefs play a great role in improving the overall management of these patients.²⁰

Electric burns were the commonest mode of causation of contracture in our series seen in 47.54% cases. In contrast, electric burn injury has been reported to represent only a small fraction of patients admitted to hospitals in the western

Fig. 3 – Angular deformity at the PIP joint of right little finger in a 12 years old female.

Fig. 4 – Bony ankylosis at the DIP joint of right ring finger in a 14 years old male.

world.^{15,21} Majority of the patients in our series received electric injury from the low quality house hold electric appliances while the child tried to grasp an un-insulated wire. These preventable injuries are associated with significant morbidity.²² Stopping this hazardous practice by enforcing proper safety measures can reduce the incidence of the permanent disabilities to a great extent.

The second common mode of burn contracture in our patients was firework injury seen in 24.13% cases. Amongst the various injuries caused by fireworks, hand injuries including burns are the commonest. Jones et al, in a study on firework injuries conducted in Ireland have reported the involvement of hand burns in 84.12% cases.²³ Spreading awareness in the general public regarding the morbidity and disability caused by fireworks and following proper safety norms during firework display is important.

A number of methods using basic reconstructive techniques have been proposed which include contracture release and grafting, cross finger flaps, side finger flaps, dorsal-dorsolateral flaps, V-Y advancement flaps and local advancement flaps.^{10,24,25} In our series we used Z/V-Y advancement flaps, free skin graft, free flaps and cross finger flaps.

We arbitrarily used 5 years period as a cut off period for neglect because of lack of any definite definition in the literature of neglect. Furthermore, during the compilation of the data, we found that the contractures with neglect of more than 10 years had inferior outcome as compared to the ones with less than 10 years neglect, so we presented the results by dividing them into two categories as group I and II.

Overall functional results in our series were satisfactory; DASH score in group – 1 was 36.90 and in group – 2 was 45.93. At the time of final assessment, there was significant improvement in the DASH score in both the groups as compared to the preoperative score. However, the results were significantly superior in group 1. It is a known fact that in a deformed joint of a child, with growth the bones also get deformed. Further with increasing delay in treatment, the contractures and deformities get worsened thus resulting in poor outcome. Early active treatment had shown good results in other series also.^{7,8}

All the complications were transitory except the epiphyseal cartilage damage in two patients resulting in permanent bony deformities; both the patients had suffered from the electric burns as a cause of the contractures. Electric burns, being more severe and deep are known to cause growth disturbances resulting from epiphyseal injury.²⁶

5. Conclusion

Major causes of neglect in the treatment of post burns contracture were illiteracy, poverty and lack of awareness. Electric current was the leading cause of post burn contracture. An earlier intervention resulted in better functional outcome. Even in delayed cases, the surgical intervention improved function. The results of surgical treatment are compromised in electric burns and the contractures with prolonged neglect.

Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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