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Case Report

Functional outcome of paediatric hand reimplantation with parents assisted physiotherapy during Covid 19 pandemic: Case report

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ABSTRACT

An amputated hand in a child is considered an absolute indication for re-implantation. A key contributor to good functional outcome is the level of amputation, type of injury, warm ischemic time as well hand rehabilitation services. The role of parents in rehabilitation services has not been well defined. In our case report, we share the functional outcome of a six year old child that was successfully re-implanted followed by multiple sessions of physiotherapy during the Covid 19 pandemic period done by the parents. The functional outcomes for motor and sensory were closely comparable to the non-injured hand at one year of follow up. Parents should play an active role in rehabilitation of paediatric patients after re-implantation. They provide a supplementary approach to rehabilitation that could be cheaper and effective in ensuring good functional outcome.

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Introduction

Paediatric hand amputation is considered an absolute indication for re-implantation except in situations where the cut hand is crushed or has prolonged ischemic time.¹ This is due to the better functional outcomes as a result of plasticity and better ability for tissues to regenerate as compared to the adults. Whereas re-implantation procedures are tedious and technically demanding, the overall function outcome is influenced by the rehabilitation efforts. There is still no universally accepted post re-implantation rehabilitation protocol with different centres having their own guidelines.^{2–5}

The role of parents in rehabilitation programs has been well documented in conditions such as cerebral palsy, autism and children with delayed milestones.^{6,7} Parents role in post hand re-implantation rehabilitation has not been well spelled out globally and more so in resource constrained countries.^{8,9} Due to the widespread lock downs and quarantines during COVID 19 pandemic it was impossible to have regular clinic based rehabilitation programs. We share our experience in the rehabilitation of a five year old child with the assistance of parents.

Case report

A five year old boy was referred to the emergency department at Kenyatta National Hospital after severing his right hand at the level of the wrist joint while using a chaff cutter (Figures 1 and 2).



Figure 1. A amputated hand of a five year old child.



Figure 2. Amputated stump of the five year old child.



Figure 3. Amputated hand repaired with a dorsal splint in place.

Table 1

The Jenssen Taylor hand therapy test at one years of follow up.

| | Re-implanted hand | Normal hand | Difference in seconds |
|---------------------------------|-------------------|-------------|-----------------------|
| Turning of cards | 12 | 9 | 3 |
| Lifting light objects | 8 | 5 | 3 |
| Lifting heavy Objects | 8 | 6 | 2 |
| Picking up small Common objects | 18 | 13 | 5 |
| Simulating feeding | 48 | 40 | 8 |
| Total | 94 | 73 | 21 |

AFTER INITIAL STABILISATION, the child was prepared for an urgent re implantation procedure. The surgery was done under general anaesthesia with fixation of the wrist joint with K wires followed by repair of neurovascular structures and tendons. The wound was then closed primarily and a dorsal splint put with a wrist in a neutral position and the metacarpal phalangeal and inter-phalangeal joints in the functional position (Figure 3).

Post operatively the arm was elevated to reduce oedema. Controlled passive flexion and extension exercises were started on the second day after surgery and continued on a daily basis till discharge. The child’s parents were then instructed to continue with this at home on a regular basis, two times in a day for thirty minutes each session for two weeks. On the fourth week the patient was started on controlled active flexion and extension exercise at the metacarpo-phalangeal and inter-phalangeal joints. The parents were again trained to carry out this activity on a daily basis. This was monitored by an occupational therapist through a smart phone video that was continuously sent to him. After removal of the K wires, parents were instructed to assist the child on active flexion and extension of the wrist joints alongside the metacarpal phalangeal and inter-phalangeal joints (Figure 4). They were further taught to assist the child on carrying out activities such as grasping of a pen, lifting light and heavy objects, picking cards and putting objects in a container.

Sensory and motor recovery was assessed using the Tinnel sign and the Jenssen Taylor hand tests at regular intervals. Sensory recovery was positive at the proximal palmar crease by the 12th week and to the finger tips by the 8th month after surgery. The Jenssen Taylor Hand therapy test at one years of follow up (Table 1).

Discussion

The evolution of hand re-implantation is attributed to the improvement of micro-surgery techniques and post-operative monitoring of patients over the years. The ultimate success of hand re-implantation is measured by the functional recovery which is influenced by the type of injury, anatomical location, age, ischemic time and availability of hand rehabilitation services.⁹ Post re implantation hand rehabilitation services have routinely been based at the hand therapy units with the



Figure 4. Re-implanted hand at one year of follow-up with good functional outcome.

patients being followed up on a regular basis. During the Covid 19 outbreak it was therefore imperative for alternative management protocols to be adopted.

The role of parents in rehabilitation of paediatric patients is well documented in paediatric neurological conditions such as mental retardation, cerebral palsy, autism and epilepsy.^{6,7} Clear guidelines and protocols have been established for such conditions with good patient support systems involving physiotherapists carrying out home visits. However, there is paucity of information in as far as home-based rehabilitation of post hand re-implantation is concerned. This could be attributed to the fact that re-implantations are still largely rare, unplanned, far spread apart making it difficult for the development of good home based rehabilitation programs.

Our rehabilitation program entailed passive hand movement within the first two days after surgery to prevent any joint stiffness as well as encourage pliability of the tendons. This was graduated to protective early active movement of both flexors and extensor tendons so as to strengthen the tendons and encourage quick recovery. After discharge this activities were carried out by the parents while monitoring was done through regular communication with the rehabilitation team. Parents were further taught to assist the patient in lifting of light and heavy objects, turning of the cards, putting objects into a box and ability to write with the hand. Video clips of these activities were sent to the hand rehabilitation team on a regular interval to ensure that proper exercises were being done.

The overall functional recovery for our patient was noted to be faster compared to the previous patients that had been re-implanted in the unit before. The child was able to have pinch and grasp grip by the fourth month. He had protective sensation to the finger by the eighth month of injury

and two point discrimination that was within 3–4 mm by one year. Jenson Taylor function test done revealed comparable result with uninjured hand in lifting light objects, heavy objects and turning of the cards. Picking of the cards and simulating feeding was however lesser than the non-injured hand.

Conclusion

Parents assisted rehabilitation of the re-implanted extremity as demonstrated in this case study could be associated with better and faster functional recovery. There is a reduced hospital visit and the child is managed in a home environment which is friendlier. It is however paramount that the rehabilitation team work closely with the family to ensure that instructions are followed. We recommend development of a clear protocol and guidelines in ensuring the success of such activities.

Declaration of competing interest

None.

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Ethical approval

Not required.

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