

Old is gold: Krukenberg operation performed in a tertiary setup in India for the rehabilitation of the amputated hand of a poor patient

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Abstract

It is a known fact that a disabled person is a greater burden to society than a dead person. Krukenberg operation, first described by German army surgeon in 1917, Hermann Krukenberg, converts a forearm stump into a pincer, so as to retain some dexterity of the hand rather than it being reduced to a mere stump. We report this case of Krukenberg operation performed in a tertiary care setup, wherein an amputated forearm stump was converted into a functional pincer that can result in huge advantage for poor amputee patients in developing countries who rely heavily on the functionality of their hands to earn their everyday meal and are unable to bear the expense of costly prosthesis. One such patient, a 25-year-old male hailing from a very poor background who came to us with traumatic amputation of his dominant hand.

Introduction

Hands are one of the most important part of the human body from both cosmetic and functional points of view. Through the power of adaptation hand has been able to assume the quality of a sense organ, in this regard it acts as a supplementary eye. In total darkness where the eyes fail, the hand gives a greater sense of security. Its highly sensitive skin provides the most important sense of touch. Since the hand performs most of the functions "ordinary or specialized", it contributes to the economic and social well-being of the individual. Loss or impairment of its function therefore results in a great catastrophe. Krukenberg Operation, though the result is not cosmetic, the patients are pleased, because of the ability to feel, and also, if they desire, a prosthesis can always be worn for cosmesis.¹⁻³

Case Report

The present case report is about a 25-year-old male, who had suffered a fall from a height in jungle and traumatic amputation of his left hand with remains of forearm amputated stump.

Patient had no any past medical or surgical history. Patient had no similar family history.

Suspecting the involvement of wild animals, patient was given anti rabies vaccine and immunoglobulin according to the WHO protocol. He also had suffered a sub arachnoid hemorrhage and was managed conservatively as advised by our neurosurgery department.

As for the amputated hand, high end prosthesis was advised for the patient but being from very poor background it was far beyond his budget. A man who depends entirely on daily wages and manual labor to feed himself and his family, losing the functionality of one hand was devastating and depressing for him. The main problem that presented before us was not only to stabilize him, but also allow him to get back into the society with gratitude and without having to depend on others for his daily chores and financial needs. Considering all these factors, Krukenberg operation was planned for him. Although this surgery is seldom done and even not recommended by many surgeons but it was currently the best available option for him. He was explained in detail about the procedure and extent of functionality he could attain. Videos and photographs were shown to further elucidate the whole process. Earlier the patient and relative were reluctant for the procedure but they had given the consent for the same.

The classical procedure described by Swanson and Swanson was followed with few modifications.⁴ A longitudinal incision was made on the flexor surface of the forearm. A similar incision on the dorsal surface slightly toward the ulnar side was made. The forearm muscles were separated into two groups and were resected in order to reduce the size of the stump.

Pronator teres was conserved as it is the main operating muscle. Hence all precautions were taken to maintain the integrity of the muscle. Hemostasis was secured. Skin edges were opposed and sutured. Post operative period was without complications. Regular dressing was done and physiotherapy was given so that the patient started using the pincers. Patient was regularly motivated. Help from the psychiatry department was taken to help him cope with his depression.⁴⁻⁷

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Key words: Krukenberg operation; Social rehabilitation; Functional rehabilitation.

Contributions: AZA, RAM: conception and design of the study, acquisition of data (laboratory of clinical), data analysis and/or interpretation, drafting of the manuscript and/or critical revision, approval of the final version of the manuscript; HMJ, AAKM: conception and design of the study, acquisition of data (laboratory of clinical), drafting of the manuscript and/or critical revision, approval of the final version of the manuscript; SR: conception and design of the study, drafting of the manuscript and/or critical revision, approval of the final version of the manuscript.

Conflict of interest: the authors declare no potential conflict of interest.

Received for publication: 20 January 2019.

Revision received: 25 February 2019.

Accepted for publication: 26 February 2019.

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Clinics and Practice 2019; 9:1128
doi:10.4081/cp.2019.1128

Discussion

Our patient suffered traumatic amputation of his dominant hand. To lose the only means of livelihood for a poor man in our country, can be devastating. But thanks to the research and innovativeness of doctors, options were made available for him to be independent for his daily chores. This was a perfect case for the krukenberg operation.

Initially, we worked on gross movements like lifting, catching, etc. and later the finer movements like writing, etc. Patient was able to follow gross movements very well, but continued to experience problems in finer works like buttoning of shirt, etc. which later was attained with the help of physiotherapy and motivation of the patient.

Though this operation is hugely debated on its aesthetic aspects, but aesthetics come only second to livelihood. Also, a person

can always wear prosthesis over the krukenberg stump. A very interesting point and a huge advantage of this procedure over prosthesis is that krukenberg stump still allows proprioception and stereognosis with the help of his pincers, which is of extreme importance. Because of proprioception and muscle power the patients are able to have very effective control over the activities being performed by these pincer. The pincers with the help of stereognosis and proprioception enact like fingers thus allowing to hold the substance according to it. Patients are able to lead an independent life and are spared from the trouble of putting on a prosthesis, which is helpful for poor patients. In fact, quite a number of patients do not prefer the prostheses later due to freedom of activities attained by the Krukenberg pincers.⁵ In developing countries where people are struggling to make ends meet on a daily basis, operation like Krukenberg's for amputees is like a second chance at life.^{2,8-10}

Krukenberg stumps can also be hidden in a similar fashion if so desired. Such patients in our society are quite acceptable, and the patients themselves take pride in demonstrating their functional capabilities with such stumps which is something unusual.

Unilateral Krukenberg operation is indicated for those who cannot afford a prosthesis, and for those in whom loss of function of the dominant hand has not been taken

over by the supporting hand either due to lack of interest on the part of the patient or due to disease or disability, for those who are blind.

The success of this procedure is largely dependent upon the patient's motivation and the post-operative care in training the forearm muscles in performing adduction and abduction movements of the radial pin-

cer over the ulnar pincer.⁶

Normally it takes about 3-4 months from the time of operation for the patient to develop sufficient power and co-ordination to perform these movements, improving the power and co-ordination of movements and so does the freedom of activities (Figures 1-5).



Figure 1. Mangled left upper extremity.



Figure 2. Mangled left upper extremity.



Figure 3. Intra operative.



Figure 4. Immediate post operative photo.



Figure 5. Post operative period of rehabilitation and retrieval of functions.

Conclusions

Krukenberg operation can prove to be a great boon for the patients in underdeveloped and developing countries as it provides a great option to the operating surgeon and the patient to live his life functionally and socially. With the property of proprioception and stereognosis the patient does not have to depend on his prosthesis for his needs and patient has psychological alleviation. With the help of physiotherapy and psychiatry and emotional development of patient these pincers will take up the role of fingers and help the patient to lead his life fully and in a very joyful manner and we also have privilege that the prosthesis can be worn over these pincers.

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