

Fracture in a Person with Spinal Cord Injury with Heterotopic Ossification due to Improper Exercise in Pandemic: A Case Report

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ABSTRACT

Fractures following inappropriate exercises are rarely reported in Spinal Cord Injury (SCI) population. During pandemic, physical inactivity and barriers to access to rehabilitation facility are conspicuous. Authors report a case of 23-year-old male with femur fracture following improper exercise and its interrelationship with Heterotopic Ossification (HO) and impact of pandemic. Patient reported with American Spinal Injury Association (ASIA) Impairment Scale (AIS) grade C tetraplegia, presented with operated left femur shaft fracture following care-partner administered sudden improper exercise. X-ray of left hip and femur revealed HO around left hip joint and intramedullary nailing of shaft of femur. Routine rehabilitation protocol for SCI was followed especially focusing on safety home-exercise precaution program during pandemic time. To the best of our knowledge, this is the first case report of long bone fracture in a person with SCI following improper exercise which is influence by pandemic situation. Here, authors described the causation of fracture in perspective of the vicious cycle of HO, improper exercise and pandemic impact. Further studies are required to find out appropriate precautionary guidelines regarding exercise during pandemic times for people with SCI.

Keywords: Coronavirus disease-2019, Education, Physical activity, Swelling

CASE REPORT

A 23-year-old male with traumatic C4 American Spinal Injury Association (ASIA) Asia Impairment Scale (AIS) grade C tetraplegia presented with an operated fracture shaft femur following care-partner administered exercise. He had Heterotopic Ossification (HO) around the left hip for last one year. The mode of injury as explained by him was: he was made to sit with support by the care-partner with leg extended, then he was made to bend forward with back pressure resulting in sudden crackling sound and followed by swelling near the left thigh. He was managed by intramedullary nailing for the fracture.

The duration of Spinal Cord Injury (SCI) was approximately two years. For the last one and half years due to pandemic and lockdown he could not have supervised exercise program from rehabilitation Outpatient Department. Patient also admitted that he reduced his physical activity in significant amount during this period. He belongs to lower socio-economic strata and lives in a place from where the distant of rehabilitation setting in tertiary hospital is around 40 kilometers. Patient attended telerehabilitation setting instead of a physical visit because of fear of infection, cost and difficulty in travel during lockdown. He underwent surgical intervention for the fracture from nearest health facility.

After 6 months of fracture, he made a physical visit to Rehabilitation Outpatient Department. Routine clinical examination was done following all Coronavirus Disease-2019 (COVID-19) precautionary protocol. Examination of affected limb revealed localised swelling near the left hip and increased local temperature. Passive range of motion of left hip was severely restricted. Blood investigations revealed that complete haemogram, liver function test and kidney function test were within normal limits except Erythrocyte Sedimentation Rate (ESR) which was found to be raised (63 mm/hour) and Alkaline phosphatase marginally raised (193.2 U/L) which is commonly seen in HO. COVID-19 Reverse Transcription-Polymerase Chain Reaction (RT-PCR) was negative. X-ray [Table/Fig-1] revealed HO around left hip joint. All the routine rehabilitation protocols like gentle passive range of motion of all limbs, two-hourly position change in bed, attendant-assisted intermittent catheterisation training, bowel

care, sensory care for areas with sensory disturbances etc., were followed for a person with tetraplegia. Special attention was given to precautionary advice regarding fracture and exercises, like health education on bone health, care-partner supervised exercises, avoiding forceful exercises, exercise in safe environment [1] and also personal hygiene care [2]. Patient and his care-partner were taught and demonstrated exercises so that he can do them safely at home in proper manner [3,4].

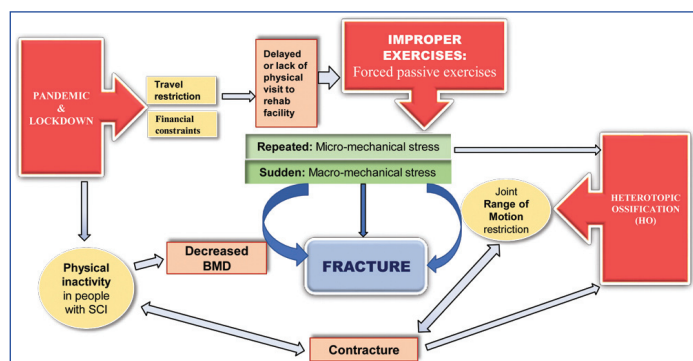


[Table/Fig-1]: X-ray showing Heterotopic Ossification (HO) around the left hip joint and intramedullary nailing in fracture shaft left femur.

DISCUSSION

This case highlights three important practical things in rehabilitation exercises for people with SCI [Table/Fig-2], firstly, how improper

exercises can cause fractures in persons with SCI and secondly how such fractures may occur in the setting of HOs, thirdly how pandemic situation may indirectly influence in such cases.



[Table/Fig-2]: Three important practical things in rehabilitation exercises for people with Spinal Cord Injury (SCI) during pandemic. (Images from left to right)

Exercise just like other medicines should be prescribed in proper frequency, intensity, duration, types and most importantly extra care in supervision and precaution should be taken in persons with disability. Care-partner also should be trained in such cases. In this case improper handling during exercise by untrained care-partner resulted in this fracture. Literature also has shown that musculoskeletal injury is mostly seen following inappropriate exercises especially in the setting of intrinsic risk factors [5]. Fractures of lower extremity have been reported more in paraplegics than tetraplegics probably due to higher activity level that is seen in people with paraplegia than tetraplegia [6-8] whereas in the present case, reduced activity played as an indirect cause.

Heterotopic ossification following fracture and immobilisation is common, but fracture due to indirect contribution from HO is peculiar. In this case, patient had restricted left hip passive range of motion (flexion 0-10°, extension 0-5° only) due to HO around left hip, sudden unaccustomed force during improper exercise might have caused transmission of force to shaft causing this fracture. Heterotopic ossification is known to be caused by micro-trauma from forced passive stretching exercises in people with SCI [9,10]. It is unremarkable that such forced exercise when applied all of a sudden may invariably induce a mechanical stress to already fragile bone resulting in a fracture. Furthermore, it is well known that in people with SCI, erosion of endosteal surface at mid-femur region leads to diminished resistance to bending and torsion [11].

On the other hand, as this was a low-energy trauma and such trauma usually cause fractures in elderly populations. Here the patient is 23-year-old but in people with SCI lower extremity fractures occur due to low-energy impacts. In this case, HO served as a mechanical cause and condition with SCI as a whole served as metabolic cause. It is also universally accepted that 'early, regular and cautious joint mobilisation' is crucial to prevent HO in SCI [6], in addition, such joint mobilisations are important to prevent any unwanted fractures. Though females with SCI have higher risk of long bones fractures and more reported in cases of lumbar lesions [7], but our case differs from literature as the mode of causation of fracture is different.

Now, this is interesting that how pandemic situation influenced the case. Due to pandemic and lockdown people with SCI have minimised their physical activity level at home and in the outside community [12]. This leads to more immobilisation and in turn more bone loss resulting in increased susceptibility to fractures following minor trauma. Transportation (i.e., availability and cost) is the most commonly reported persistent physical barrier to exercise in SCI population [13]. Lockdown itself caused travel restrictions that hinders physical visit to rehab setting. Even this pandemic created

a financial constraint to people with lower socio-economic status. Such constraints already make difficulties in travelling and spending for daily livings and then comes cost of telerehabilitation facility at home like cost of smartphones, internet and others which become an extra burden to people with lower socio-economic status in a developing country setting.

Furthermore, telerehabilitation or telehealth service though reduces cost of health care system in terms of less patient visit leading to reduction of travel cost, but in some context, it increases cost like higher cost in running the facility and equipment. In spite of it, it is quite practical especially during peak times of pandemic to follow more telerehabilitation approaches. But finding a better means to cater the fruitful and effective telehealth services should be the primary goal during pandemic for people with SCI. Finally, few learning points from this case are, in current pandemic situation exercises should be supervised atleast once either via physical visit or telerehabilitation facility like synchronous tele-exercise [14]. Examining the patient atleast once in the first physical visit would help in better planning of management and then subsequent visits can be taken up as in telehealth program. Any new concern that needs a physical examination must not to be neglected. Nevertheless, during pandemic, routine preventive measures for COVID-19 also should be taken during physical visit. Furthermore, exercises must be demonstrated well by recorded video or leaflets so that persons with SCI can perform them at home safely or with the help of care-partner. Atleast clinically fracture risk assessment must be done before prescribing exercises and all the precautions should be highlighted and made understood well before initiating demonstration of exercises.

CONCLUSION(S)

All people with SCI should be encouraged to increase their physical activity level according to their own well-being. Further research is needed to find out the level of physical activity and exercise adherence during pandemic time and also any exercise induced fractures should be investigated thoroughly in persons with SCI for better personalised exercise prescription. Putting into pandemic perspective we should consider effective rehabilitation approach as one of the essential health services and we urgently need a 'call for action' to prevent any untoward events.

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