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Case Series

Surgery Section

Motorcycle Chain Entrapment Injuries to the Hand during Routine Maintenance: A Case Series

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ABSTRACT

Motorcycle-related hand injuries are commonly associated with road traffic collisions; however, injuries sustained during routine chain cleaning and lubrication remain underreported despite being entirely preventable. This case series included 14 consecutive patients treated between April 2025 and December 2025. All patients were male, with a mean age of 29.6 ± 10.8 years (range 17-55 years). The dominant hand was involved in 9 (64.3%) patients, while injury laterality showed right-hand involvement in 10 (71.4%) and left-hand involvement in 4 (28.6%) patients. The index finger was most commonly affected in 5 (35.7%) cases, followed by the middle finger in 4 (28.6%) cases. All 14 (100%) patients presented with contaminated wounds. Definitive management included primary closure in 4 (28.6%) patients, local flap reconstruction in 3 (21.4%), split-thickness skin grafting in 1 (7.1%), tendon repair in 2 (14.3%), Kirschner wire fixation in 2 (14.3%), and revision amputation in 2 (14.3%). Postoperatively, superficial wound infection occurred in 2 (14.3%) patients and resolved with conservative management, while mild residual stiffness was observed in 3 (21.4%) patients. No cases of deep infection, osteomyelitis, flap or graft failure, or major limb compromise were noted. Complete wound healing was achieved in all patients. Motorcycle chain entrapment injuries represent a preventable yet clinically significant cause of hand trauma in young males. Early irrigation, prompt debridement, and defect- specific reconstruction are associated with favourable outcomes and minimal complications.

Keywords: Case series, Contaminated wound, Crush-avulsion injury, Fingertip amputation, Hand trauma, Motorcycle chain injury, Soft-tissue reconstruction, Tendon injury

INTRODUCTION

Road traffic injuries remain a major global public health concern, particularly among young and economically productive populations. The World Health Organisation reports that road traffic trauma is a leading cause of mortality worldwide, with a disproportionately higher burden in low- and middle-income countries where two- wheelers constitute a primary mode of transport [1]. While most literature focuses on collision-related trauma, preventable injuries associated with vehicle maintenance practices remain under-recognised. Among these, motorcycle chain entrapment injuries represent a neglected yet entirely preventable cause of hand trauma [2].

Motorcycle chain entrapment injuries occur when fingers are caught between the rotating chain and sprocket, producing combined crush, traction, and rotational forces [3].

CASE SERIES

This case series included 14 consecutive patients treated between April 2025 and December 2025. All patients were male (14, 100%), with a mean age of 29.6±10.8 years (range 17-55 years). The dominant hand was defined as the hand preferentially used for daily activities such as writing and feeding. The dominant hand was involved in 9 (64.3%) patients. Injury laterality showed involvement of the right hand in 10 (71.4%) patients and the left hand in 4 (28.6%) patients. Dominant-hand involvement and injury laterality were analysed as separate variables. Therefore, injury laterality (right or left hand) should not be interpreted as directly corresponding to dominant- or non-dominant-hand involvement [Table/Fig-1].

The index finger was the most commonly involved digit in 5 (35.7%) patients, followed by the middle finger in 4 (28.6%) patients, with involvement of other digits and multiple digits observed less frequently [Table/Fig-2].

All patients (14, 100%) sustained contaminated injuries, predominantly presenting as crush-avulsion soft-tissue damage. Structural involvement included tendon injury in 2 (14.3%) patients, phalangeal fractures in 2 (14.3%), and distal fingertip amputations in 2 (14.3%) [Table/Fig-3].

The total number of procedures exceeds the total number of patients because some patients underwent more than one procedure during the same treatment episode.

All patients underwent early wound irrigation and surgical debridement. Minor injuries without significant tissue loss were managed

Variables	Number (%)
Total patients	14
Male	14 (100%)
Mean age	29.6±10.8 years
Age range	17-55 years
Right hand involved	10 (71.4%)
Left hand involved	4 (28.6%)
Dominant hand injured	9 (64.3%)
Non-dominant hand injured	5 (35.7%)
Mechanics	4 (28.6%)
Non-mechanics	10 (71.4%)

[Table/Fig-1]: Demographic and injury characteristics (n=14).
Dominant hand was defined as the hand preferentially used by the patient for routine daily activities such as writing and feeding. Dominant-hand involvement was analysed independently of injury laterality.

Digit involved	Number of patients (%)
Index finger	5 (35.7%)
Middle finger	4 (28.6%)
Ring finger	1 (7.1%)
Thumb	1 (7.1%)
Multiple digits	3 (21.4%)

[Table/Fig-2]: Digit distribution.

Injury type	Number (%)
Soft-tissue laceration/crush	14 (100%)
Tendon injury	2 (14.3%)
Phalangeal fracture	2 (14.3%)
Fingertip amputation	2 (14.3%)
Soft tissue loss requiring flap/graft	4 (28.6%)

[Table/Fig-3]: Structural involvement.

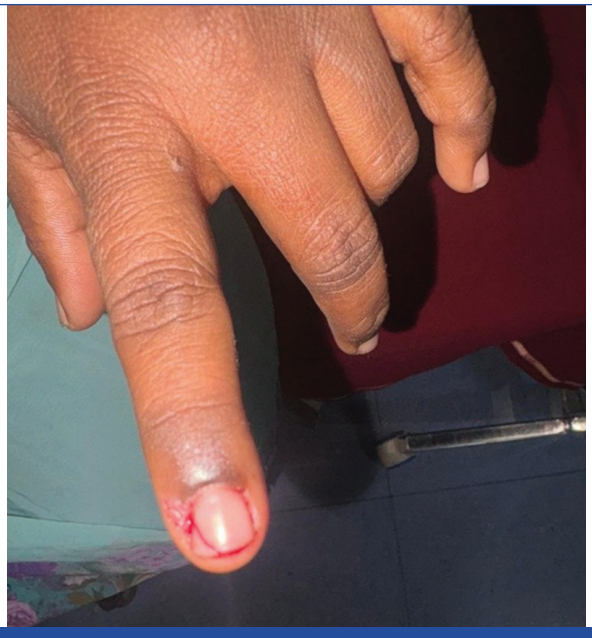
conservatively in 1 (7.1%) patient, while primary closure was performed in 4 (28.6%) patients with clean, well-vascularised wound margins. Local flap reconstruction was required in 3 (21.4%) patients with exposed tendon or bone, and split-thickness skin grafting was performed in 1 (7.1%) patient with superficial soft-tissue defects [Table/Fig-4]. Some patients required combined reconstructive and skeletal or tendon procedures; therefore, the total number of procedures recorded exceeded the total number of patients treated.

Procedure	Number (%)
Conservative management	1 (7.1%)
Primary closure	4 (28.6%)
Local flap reconstruction	3 (21.4%)
Split-thickness skin graft	1 (7.1%)
Tendon repair	2 (14.3%)
K-wire fixation	2 (14.3%)
Revision amputation	2 (14.3%)
Delayed closure	1 (7.1%)

[Table/Fig-4]: Surgical procedures performed.

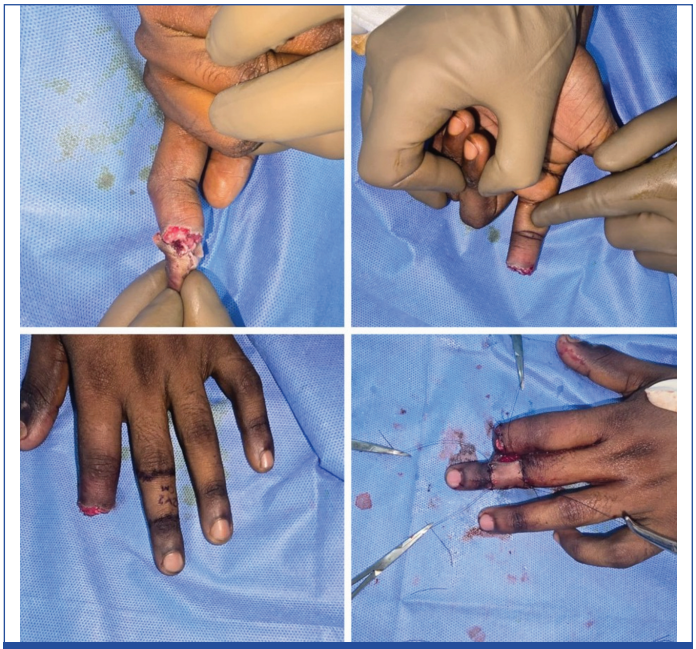
Tendon repair was undertaken in 2 (14.3%) patients with documented tendon disruption, and K-wire fixation was performed in 2 (14.3%) patients with associated phalangeal fractures. Revision amputation was required in 2 (14.3%) patients with non-salvageable distal fingertip injuries, while delayed closure was performed in 1 (7.1%) patient due to heavy contamination [Table/Fig-4].

Postoperatively, superficial wound infection occurred in 2 (14.3%) patients, both of whom resolved with conservative management. Mild residual stiffness was observed in 3 (21.4%) patients, particularly in those with tendon involvement. No cases of deep infection, osteomyelitis, flap or graft failure, or major limb compromise were recorded. Complete wound healing was achieved in all patients. Minor fingertip laceration is shown in [Table/Fig-5].



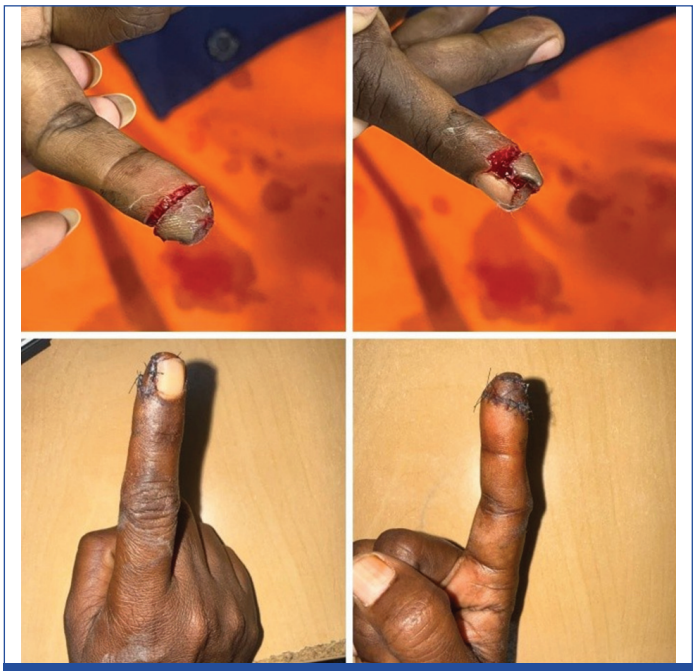
[Table/Fig-5]: Clinical photograph showing a minor fingertip laceration with preserved nail plate and minimal soft-tissue loss.

Intraoperative sequence demonstrating cross-finger flap reconstruction for coverage of a distal digital defect following motorcycle chain crush–avulsion injury. The images show defect assessment, flap elevation from the adjacent finger, inset of the flap, and postoperative coverage of exposed tissue [Table/Fig-6].



[Table/Fig-6]: Cross-finger flap reconstruction for digital soft-tissue defect.

Clinical and intraoperative images illustrating primary closure of a traumatic fingertip laceration following wound debridement. The defect margins were approximated with interrupted sutures after adequate irrigation and removal of devitalised tissue [Table/Fig-7].

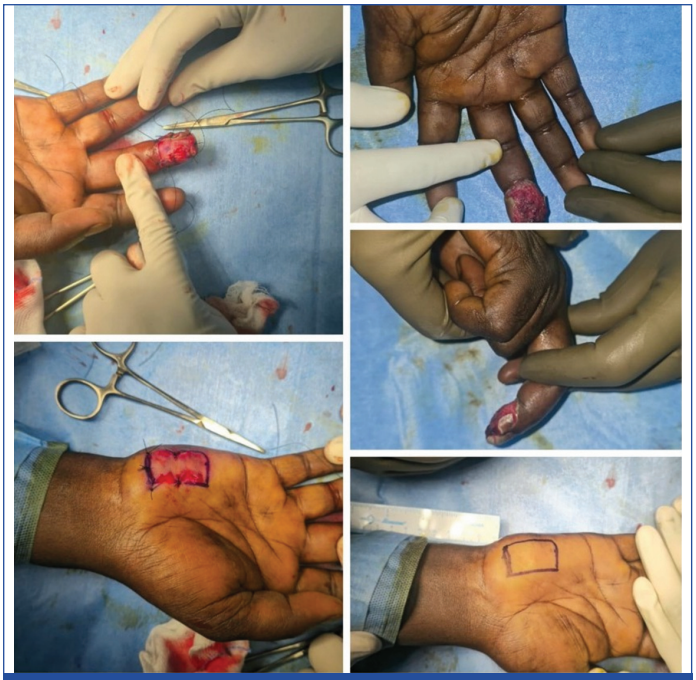


[Table/Fig-7]: Primary suturing of traumatic finger laceration.

Operative photographs showing palmar split-thickness skin graft harvesting and graft placement for reconstruction of a soft-tissue defect after debridement of crushed tissue. The graft provides secondary coverage to restore skin continuity and protect underlying structures [Table/Fig-8].

DISCUSSION

In the present series of 14 patients, all injuries were contaminated (100%), complete wound healing was achieved in all cases (100%), superficial infection occurred in two patients (14.3%), and no deep infection (0%) or major limb compromise was observed.



[Table/Fig-8]: Palmar skin graft (second-layer coverage) for digital defect.

Consistent with our findings, previous research on 136 motorbike chain-related fingertip injuries reported a predominance of young adult males (mean age 29 years), with the right hand more frequently involved (74.3%). The index and middle fingers were the most commonly affected digits, and Allen type III injuries accounted for nearly half of all cases (46.3%). V-Y plasty was the most frequently utilised reconstructive procedure (35.3%) [4].

Karahan G et al., highlighted that motorcycle chain injuries predominantly affect young males [5]. This is consistent with our cohort, in which 100% of patients were male, with a mean age of 29.6 years.

Ilavarasan S et al., emphasised that management strategies in fingertip injuries must be individualised, ranging from conservative care to flap reconstruction [6]. This is consistent with our approach, in which treatment was tailored to tissue loss.

Replantation of fingertip amputations in crush injuries remains controversial. Ishikawa K et al., reported replantation success rates of up to 80% in selected cases, primarily in clean-cut injuries [7]. However, in crush-contaminated injuries such as those seen in our cohort, outcomes are less predictable.

In a case series by Singh S et al., out of 15 young patients with finger or hand crush injuries caused by motorcycle chains or machine gear systems, replantation or revascularisation was attempted in all cases. Successful salvage was achieved in nine patients (60%), while six patients (40%) experienced failure of revascularisation, resulting in loss of the injured digit [8].

A study of motorcycle chain-related amputations reported an 83.3% survival rate following replantation (5/6 cases), with no infection-related complications and favourable functional outcomes, including return to work within three months [9].

Overall, when compared with available literature, our study demonstrates that despite 100% contamination and complex injury mechanisms, outcomes can be optimised with early intervention, resulting in 100% healing, low superficial infection (14.3%), and zero deep infection or limb loss.

CONCLUSION(S)

Motorcycle chain entrapment injuries represent a rare yet entirely preventable form of contaminated hand trauma, predominantly affecting young males during routine self-maintenance activities. Overall, this series demonstrates that while motorcycle chain entrapment injuries are inherently severe due to their mechanism, favourable outcomes can be consistently achieved through early, structured management combined with preventive strategies aimed at reducing exposure to this avoidable risk.

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