

Pattern and Presentation of Pediatric Spoke Wheel Entrapment Injuries: Our Hospital Experience

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ABSTRACT

Objective: Finding out how often and how severely kids get their feet caught in the spokes of motorcycle wheels, and what it means for treatment options.

Study design: A cross-sectional study

Place and Duration: This study was conducted in Ibn-e-Sina University, Muhammad Medical College and Hospital Mirpurkhas from February 2022 to February 2023.

Methodology: The study included children who had sustained motorbike spoke wheel injuries after getting their feet entrapped in it. The children were assessed for the severity of the injury as well as the location of the injury. The classification of the injuries was done according to the Tscherne and Oestern classification and graded as 0, I, II, and III. Complete history of the patients was taken followed by a physical examination. After that, relevant investigations were ordered such as radiographs and laboratory investigations.

Results: The total number of participants in the present study was 115. The mean age of the participants was 8.62±7.23 years. There were 85 (73.91%) male and 30 (26.09%) female. A total of 78 (67.83%) patients had their right feet injured and 37 (32.17%) patients had their left feet injured. Injury of grade 0 was documented in 17 (14.78%), grade I in 33 (28.69%), grade II in 42 (36.52%) patients, and grade III in 23 (20%) patients. The most common area to get injured in the accident was the heel pad and it was affected in 63 (54.78%) patients. Rupture of the tendon was seen in 11 (9.56%) patients. Fracture of bone was seen in 9 (7.82%) children and only 1 (0.86%) children suffered from neurovascular injury.

Conclusion: Injury because of the Motorbike spoke wheel results in different patterns causing multiple levels of damage to tissues and even fractures. Nonetheless, most injuries are related to soft-tissues loss. The most commonly injured area is the heel pad. Phalanges and calcaneus were commonest injured bones.

Keywords: Spoke wheel, Motorbike, Fracture, Heel pad, Tscherne and Oestern

INTRODUCTION

Motorbike spoke wheel injuries result in the entrapment of the foot of an individual in the rotating spokes of a motorbike wheel [1]. Children under the age of 10 years are more prone to have these accidents and injuries [2]. The rate of prevalence of these accidents in Nigeria is 10.3% [3]. In one of the major cities of Pakistan, the percentage is 21.7% [4]. Motorbikes is a frequent mean of travel for the poor masses of Pakistan. Parents drop their children at their schools on motorbikes since it is difficult for them to afford private transportation. The entrapment of the foot occurs as a result of the hanging of the foot of the children as they cannot reach the stand made for resting the foot [5]. It has been seen that the prevalence of such injuries is directly proportional to the increase in number of the passengers on the motorbike and the rough quality of the roads [6].

The severity of limb injuries is variable such as lacerations, abrasions, and even fractures leading to amputation of the foot [7]. These injuries can look mild in the beginning and can make the surgeon overlook the severity of the underlying injury [8]. The area which is at the highest risk of receiving an injury is the heel. Due to the complex structure of healing, the treatment can be challenging as the injury can affect the skin, tendons as well as bones [9]. For the classification of these injuries, the most preferred classification is Tscherne and Oestern classification [10]. The grading is done in such a way that the injuries involving soft tissues and contusions, were graded as grade 0. Those injuries that resulted in minor lacerations and bruises were graded as grade I. Injuries with major soft tissue involvement were called grade II injuries and those caused neurovascular injury, tendon rupture, and fractures were called grade III injuries.

The present study aims the determination of the presentation and pattern of the injuries caused by the foot getting stuck in the spoke of the wheel of motorbikes. The motive of the study is to provide better and more effective treatment to the children

presenting with these injuries in the A&E department of the hospital.

METHODOLOGY

The present study is a descriptive study that was conducted on a115 children. The participants in the present study were both male and female. All of the patients considered in the study had acquired injuries on their feet due to their feet getting stuck in the motorbike spoke wheel. As per the inclusion criteria of the study, the patients included in the study had got injuries within 3 days of presenting to the hospital. According to the exclusion criteria of the study, the patients who had sustained injuries due to any other kind of accident, fall, or poly-trauma (with other associated injuries during the accident), were excluded from the study.

The parents of all the patients were described in the study and consent was taken from them. The patients were assessed thoroughly and resuscitated according to the protocols of ATLS. Complete history of the patients was taken followed by a physical examination. After that, relevant investigations were ordered such as radiographs and laboratory investigations. The classification of the injuries was done by Tscherne and Oestern classification.

The data of the patients were carefully collected. The data was analyzed by IBM SPSS version 36. Quantitative variables such as time since the accident and age were presented in terms of mean and standard deviation (SD). Qualitative variables such as the side of injury and gender were presented in terms of frequency and percentage. The data was represented in the form of tables as needed.

RESULTS

We included 115 children who had acquired injuries from the motorbike spoke wheel. The mean age of the patients was 8.62±7.23 years (Range: 4-12 years). There were 85 (73.91%)

male patients and 30 (26.09%) female patients. A total of 78 (67.83%) patients had their right feet injured and 37 (32.17%) patients had their left feet injured. Most of the patients were received within 9 hours of the accident. The mean duration after which the patients reached the hospital was 4.3±5.1 hours. The peak time in which the patients were presented was 7 AM to 9 AM as this is the time in which people drop by their children at schools. The other peak time was 2 PM to 4 PM because, during this time, parents pick up their children from school. The commonest site of injury was the heel pad in 63 (54.78%) patients followed by rupture of tendons seen in 11 (9.56%) patients. Out of these 11 children, 8 (6.95%) had Achilles tendon rupture, 2 (1.73%) had extensor tendon rupture and 1 (0.87%) had flexor tendon rupture. Overall 9 (7.82%) patients received bone fractures. Out of these 9 patients, 3 (2.61%) patients had calcaneus and phalangeal fractures, 1 (0.87%) patient had a metatarsal fracture, 1 (0.87%) had talus fracture, 1 (0.87%) had medial malleolus fracture, 1 (0.87%) had distal tibia fracture, 1 (0.87%) had lateral malleolus fracture and 1 (0.87%) had distal fibula fracture. A total of 1 (0.87%) patient had a transection of the posterior tibial nerve and artery. All the participants of the study were given an efficient level of treatment by the same team of surgeons. The demographic data of the patients have been given in Table 1.

Table 1: Demographic data of 115 patients

Variables	Number of patients	Percentage
Female patients	30	26.09
Male patients	85	73.91
Left foot	37	32.17
Right foot	78	67.83
Plantar surface	18	15.65
Dorsum of foot	34	29.56
Heel	63	54.78

Injury of grade 0 was documented in 17 (14.78%), grade I in 33 (28.69%), grade II in 42 (36.52%) patients, and grade III in 23 (20%) patients. The classification of the injuries has been given in Table 2.

Table 2: Tscherne and Oestern's classification of injuries

Variable	Grade 0 (n=17)	Grade I (n=33)	Grade II (n=42)	Grade III (n=23)
	Number (%age)	Number (%age)	Number (%age)	Number (%age)
Female patients	5 (16.67%)	8 (26.67%)	4 (13.33%)	13 (43.33%)
Male patients	12 (14.11%)	25 (29.41%)	38 (44.7%)	10 (11.76%)
Left foot	7 (18.92%)	12 (32.43%)	11 (29.73%)	7 (18.92%)
Right foot	12 (15.38%)	23 (29.49%)	33 (42.31%)	10 (12.82%)
Plantar surface	2 (11.11%)	1 (5.56%)	8 (44.44%)	7 (38.89%)
Dorsum of foot	6 (17.65%)	8 (23.53%)	14 (41.18%)	6 (17.65%)
Heel	5 (7.93%)	7 (11.11%)	31 (49.21%)	20 (31.75%)

DISCUSSION

The present study included 115 children who had presented to the A&E department for the treatment of the injuries they acquired in a running motorbike by the entrapment of their foot in the spoke wheel. These patients were assessed for the type of injuries they received so that better treatment strategies could be designed based on the pattern identified in the study. One such study was done by Khan et al in which they attempted to determine the pattern of the injuries. They included 150 patients in their study with such injuries. Like the present study, they graded the injuries from 0 to III. They concluded that the pattern of injuries was vast. However, soft tissue injuries were the commonest and the frequently involved area of the foot was the heel pad [11]. Their study showed similar findings to that of the present study.

One such study was done by Khan et al in which they attempted to identify the pattern of spoke wheel injuries received from a motorbike ride. However, their study was concerned with adults and not children. They included 2000 patients in their study, mostly males. They concluded that fractures and abrasions were the commonest injuries received in such accidents. They also inferred that young males were more prone to have such accidents [12]. Ahmed et al conducted a study to focus on the risk factors of these injuries. They found that proper education of the people and observation of safety measures can help in the reduction of these injuries [13].

The study of Murgia et al was concerned more with the treatment of these injuries. They treated the heel pad using a flap of the fascio-cutaneous sural artery. They found the technique useful and recommended it [14].

CONCLUSION

There are various patterns of fractures and tissue damage in the Motorbike spoke wheel injuries. The injuries result in the loss of soft tissue in most of the cases. The commonest area of the foot to be affected is the heel pad. The commonest fractures as a result of these injuries are toes and calcaneus.

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