Patient perception on the effectiveness of shin pads in reducing the severity of injuries to the tibia following motorcycle accidents

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Abstract

This study aims to assess the perception of motorcyclists on the effectiveness of shin pads in reducing the severity and preventing tibial injuries, and the likelihood of them wearing shin pads of proven effectiveness if these were available. 76 male motorcyclists (mean age 27.7 ± 12.7 years) admitted to the hospital after their motorcycle accidents were interviewed after the interviewer had demonstrated to them the impact attenuating effects of the shin pads. 45 (59%) patients felt that the shin pads would be able to reduce the severity of tibial injuries. Patients aged ≤ 22 years were more likely to feel that the shin pads would not be able to reduce the severity of tibial injuries ($p<0.008$). 36 (48%) patients said that they would wear the shin pads. Patients aged above 22 years were more likely to agree to wear the shin pads than those below 22 years (63% compared to 35%) but this did not reach statistical significance ($p<0.055$). In conclusion, the group most at risk of injury is also the group least likely to feel that shin pads would help to reduce injuries, least likely to use and therefore benefit from the use of properly designed shin pads if they were to become available. This suggests that attention should not be focused on this method of injury prevention at the present moment.

Key words: motorcyclists, accidents, shin pads, tibial injuries

Introduction

Fractures and injuries resulting from direct impact can be prevented or reduced in severity if this force can be attenuated by external means. In the elderly population, external hip protectors reduced the risk of hip fractures following a fall (Lauritzen *et al.*, 1992). The use of protectors to prevent injuries is widely seen in sports, and shin guards must be worn in competitive soccer (International Football Association Board, 2002). The use of safety helmets has been shown to reduce mortality from head injuries in motorcyclists (Kraus *et al.*, 1994). In Sweden, impact attenuating clothing reduced the frequency of fractures by 30% (States, 1987).

Tibial fractures are the most common major long bone fractures in accidents involving the motorcyclists (Bried *et al.*, 1987). In Malaysia, open tibial fractures are the most common open fractures requiring external fixation and most of these patients are motorcyclists (Yeap *et al.*, 2000). In 1997, 51% of the registered vehicles in Malaysia are motorcycles, and motorcyclists formed 49% of all reported road traffic accidents (Royal Malaysian Police) (PDRM). Therefore, lower leg injuries and tibial fractures consequent to motorcycle accidents is an important public health issue and measures to prevent these injuries should be considered.

The tibia is very exposed to injuries in motorcyclists. It has very little soft tissue envelop on the anteromedial surface to absorb the impacting force. The use of impact attenuating equipment, possibly in the form of shin pads, may therefore have a role in reducing the severity of and in some cases, prevention of severe injuries to the tibia in motorcyclists.

This study was conducted to assess the perception of motorcyclists on the effectiveness of shin pads in injury prevention following a crash and to assess the likelihood of motorcyclists wearing them if shin pads of proven effectiveness were to become available. It was intended to be a pilot study before possibly embarking on a programme to design shin pads for motorcyclists.

Materials and Methods

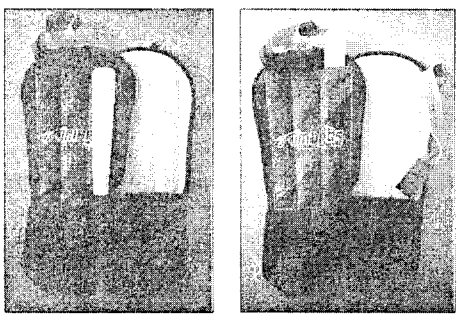
76 male motorcyclists who required a hospital admission following their motorcycle crash were interviewed in hospital by 2 interviewers (JLL and TYP). Only male patients were interviewed

because most patients (90%) involved in motorcycle accidents are males (Pang *et al.*, 2000). The shin pads used (Figs. 1a & b) were those used for football and were bought from a sports shop and they cost RM20 (USD5.30). The patients were given the shin pads to feel and to look at more closely. A demonstration to show its impact attenuating effect was made with the interviewer wearing the shin pad on one side and knocking the protected tibia with the heel of the other foot while wearing their shoes.

Patients were then asked (a) if they thought the shin pads would be able to reduce the severity of tibial injuries sustained in an accident, (b) if they would be willing to wear shin pads if the shin pads could prevent or reduce the severity of the injuries sustained to the tibia in an accident, (c) if they thought there was a need to design special shin pads for motorcyclists, and (d) if they would be willing to purchase shin pads which could reduce the severity of lower limb injuries. The replies were either 'Yes', 'No' or 'Don't know'.

Patients were also asked how much they would be willing to pay for shin pads of proven effectiveness, and would they be willing to wear the shin pads if the shin pads were given to them. We also tried to ascertain the reasons for those patients who said they would not wear the shin pads.

Data was evaluated using the Statistical Packages for Social Sciences software (SPSS, version 9.0, Chicago, Ill. USA). The Pearson chi-square test (p value of < 0.05 being significant) was used for statistical analysis where appropriate.



1a 1b

Figs. 1a & b. The shin pads used for this study. They are held to the shin by Velcro straps and have ankle padding as well.

Results

The mean age of the patients was 27.7 ± 12.7 years (range 15-61 years). 63 patients were riding the motorcycle at the time of the crash. 13 were pillion riders and 2 patients could not remember their accidents clearly due to head injuries. The types of injuries were recorded in 58 patients: 54 patients (93%) had fractures, 3 (5%) had deep lacerations and soft tissue injuries and one (2%) had an elbow dislocation. The injuries in the remaining 18 patients were not recorded by one of the interviewers. However, based on admissions to the hospital, they were likely to have sustained significant injuries, most likely fractures which required further management. Of the 58 patients with known injuries, 45 patients (78%) had at least one fracture of the femur, tibia or fibula and 13 patients (22%) had other injuries.

Results are presented based on the number of patients who responded to the individual question and the number of respondents therefore may differ. 45 patients (59%) felt that the shin pads would be able to reduce the severity of tibial injuries sustained in an accident, 15 patients (20%) felt that it would not and 16 patients (21%) were unsure (Table 1). Patients aged ≥ 22 years were more likely to feel that the shin pads would be able to reduce the severity of tibial injuries ($p<0.008$).

Table 1. Patient age groups and their opinion on the ability of shin pads to reduce the severity of tibial injuries

Patient age group (years)	Opinion			Total
	Yes	No	Don't know	
≤ 22	17 (42%)	11 (28%)	12 (30%)	40
> 22	28 (78%)	4 (11%)	4 (11%)	36
Total	45	15	16	76

($\chi^2 = 9.77$, df = 2, p 0.008)

Even if the shin pads could prevent or reduce the severity of the injuries to the tibia, only 36 (48%) patients said that they would wear the shin pads (Table 2). One would only do so with law enforcement. Although patients aged > 22 years were nearly twice as likely to agree to wear the shin pads, this difference did not reach statistical significance ($p<0.06$). The most common reasons given by those who would not wear the shin pads wear were that it would be too inconvenient to

wear it (57%) and that they just would not be bothered to do so (21%).

Table 2. Patient age groups and their willingness to wear shin pads

Patient age group (years)	Opinion			Total
	Yes	No	Don't know	
≤ 22 years	14 (35%)	12 (30%)	14 (35%)	40
> 22 years	22 (63%)	6 (17%)	7 (20%)	35
Total	36	18	21	75

(χ^2 = 5.80, df = 2, p = 0.055)

Table 3. Patient age groups and their willingness to purchase shin pads

Patient age group	Opinion			Total
	Yes	No	Don't know	
≤ 22 years	12 (33%)	12 (33%)	12 (33%)	36
> 22 years	19 (63%)	3 (10%)	8 (27%)	30
Total	31	15	20	66

(χ^2 = 7.30, df = 2, p = 0.026)

47% of the patients said they would be willing to purchase shin pads that would be able to prevent or reduce injuries to the tibia in the event of an accident (Table 3). Patients aged > 22 years were nearly twice more likely to do so than those aged ≤ 22 years and this difference was significant ($p<0.03$). Of the 56 patients who commented on what they felt was a reasonable price for shin pads, 14 (25%) said less than RM15, 20 (36%) said between RM16-30, 15 (27%) between RM31-50, and 7 (13%) between RM51-100. Therefore, 87% would not pay more than RM50 for the shin pads. 41 of 72 patients (57%) felt there was a need, 11% felt there was not and 32% were unsure as to the need to design special shin pads for motorcyclists.

Even if the shin pads were given to the patients, only 40 of 71 (56%) patients said they would wear it and 3 of these would only do so for long-distance travelling. 10 (14%) would not and 21 (30%) did not know if they would do so.

Discussion

The shin pads used in this study were designed for sports and to some patients they might not have appeared strong or durable enough to reduce the severity of injuries in the event of an accident. This may have reduced the number of patients who thought they would be effective in reducing the severity of injuries. Nevertheless, it is encouraging that more than 50% of the patients surveyed felt that there was a need to design proper shin pads that can reduce injuries. Patients may also feel that the forces involved in motorcycle accidents are far greater than that used by the interviewers to kick their shin. However, we feel that for the purpose of demonstrating the impact attenuating effect of shin pads, it is likely to have achieved its effects because such a kick would have caused considerable pain without the shin pads.

Properly designed shin pads that can attenuate the impact should reduce the risk of fractures to the tibia. However, these must be worn to be effective. The finding that patients aged ≤ 22 years in this study were more likely to think that the shin pads would not reduce the severity of injuries is a concern. More importantly, they were also much more likely not to wear them even if they could reduce injuries. The age group between 16-20 years formed the biggest group (31%) in fatally and seriously injured motorcyclists (Pang *et al.*, 2000). This suggests that even if we could produce shin pads that would significantly prevent or reduce the severity of injuries to the lower leg, the benefits if the shin pads are to be worn voluntarily may not be as great because the ones most likely to benefit would also be the ones most likely not to use them if they had a choice.

What if we tried to make it mandatory to wear shin pads for motorcyclists? A prospective trial would be required to demonstrate the benefits first before it would be possible to do so. Here again, the finding that 22 of 38 patients aged ≤ 22 years would not or did not know if they would wear shin pads of proven value even if they were given to them is of concern if such a trial was considered.

Would legal enforcement of shin pads make a difference, as legal enforcement of safety helmets for motorcyclists has been shown to reduce fatalities in some countries (McSwain & Petrucelli, 1984). We feel that it is unlikely to make a significant difference at the present moment, judging from our experience with safety helmets. Although safety helmet regulations have been in existence in Malaysia since 1971, only 54% of motorcyclists use helmets properly, 21% use them improperly and 24% did not wear them at all. Only 37% of motorcyclists aged < 20 years

wore the helmets properly compared to 69% in those aged > 40 years (Kulanthayan *et al.*, 2000). Therefore, even with legislation, compliance remains a major obstacle in our setting judging from the use of safety helmets. Legislation will also be exceedingly unpopular and may not be practical.

We accept that the motorcyclists interviewed in this study are not representative of the population. However, we wanted to know their views specifically as they have just been involved in a serious accident and most of them had a lower limb injury. If these motorcyclists would not wear them, others are possibly even less likely to do so.

In conclusion, there is a need to prevent and reduce the severity of injuries to the lower leg and tibia of motorcyclists. Use of properly designed shin pads that will attenuate the impact is one possible method to reduce these injuries. However, the likely non-compliance in the groups most at risk of injury would suggest that attention should not be focused on this method until such a time when motorcyclists are better educated and are more willing to accept measures in injury prevention.

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