

Epidemiology of Kite Surfing Injuries among Recreational Athletes

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ABSTRACT: **Background:** Kite surfing is one of the trendiest water sports worldwide. With its growing popularity evidence has begun to accumulate regarding its potential for injuries which range from minor insults to death.

Objectives: To define the epidemiology and distribution of common kite surfing injuries among recreational athletes.

Methods: An open letter was published on the web calling for surfers to report injuries inflicted during recreational kite surfing. In addition, we received data from the National Center for Trauma and Emergency Medicine Research.

Results: Our survey yielded only a small series of 48 injuries. Most kite surfing injuries are isolated injuries, although some are life threatening as occurred in two surfers who died due to severe head injuries. Among the injuries, 72.9% are related to the musculoskeletal system, followed by head and chest injuries (18.7% and 14.6%, respectively). Of the orthopedic injuries 48.6% are fractures, the majority in the lower limbs (58.8%).

Conclusions: Our findings combined with those of previous articles on kite surfing-associated injuries contribute to a better understanding of such injuries, raise awareness among emergency department personnel, and indicate precautions needed to avoid or lessen incapacitating and potentially life-threatening injuries.

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Kite surfing has largely taken over the position of windsurfing as the leading water sport in the world. The main reasons for its rising popularity are the relatively affordable gear, ease of learning curve, and convenient equipment handling and packaging compared to windsurfing. On the other hand, it seems to be more conducive to injuries due to the powerful tugging force achieved by the large kites and very high jumps, not usual in windsurfing and other non-motorized marine activities [Figure 1].

Despite increasing reports of these injuries, the data are still insufficient to capture the true incidence of this emerging

Figure 1. High jump possible due to the pull of the kite, exposing the surfer to injury upon landing



extreme sport. A detailed search on Pubmed revealed only nine reports describing kite surfing-related trauma. A previous study showed an overall self-reported injury rate of 7 per 1000 hours of practice, with the most commonly injured sites being the foot and ankle (28%), skull (14%), chest (13%), and knees (13%) [1]. In that report, 56% of the injuries were attributed to the inability to detach the kite from the harness in a situation involving loss of control over the kite. Athletes using a quick-release system tended to sustain fewer injuries than athletes without a release system. Fortunately, these systems have recently become an integral part of kite surfing.

Another study reported a much higher injury rate of 105 injuries/1000 hours of surfing, but this study included in its survey minor injuries such as skin bruising [2]. The study found kite surfers to be more prone to injuries compared to those practicing any other towed water sport activity or even to personal watercraft riders.

With the increasing popularity and practice of this activity, kite surfers are now pushing the limits and surf in more extreme weather. This is reflected by more serious injuries, some resulting in the death of surfers. Data retrieved from the helicopter emergency medical services (HEMS) records in the Netherlands revealed limb- and life-threatening injuries, including bilateral carotid dissection, femoral fractures, open comminuted patella fracture with severe degloving, and one case of head trauma and fractured cranium [3]. The last patient was dead on arrival of the medical team. Although potentially

fatal, it was shown by data from the Air Mercy Service in the Cape Province, South Africa, that among the 30 requests for help none of the surfers was wearing life vests [4].

Most injuries reported previously were attributed to inability to detach the kite from the harness. More recently however, with technical improvements, the main mechanisms of injuries are reported to be uncontrolled actions and unsuccessful tricks and jumps with poor landings [5]. Moreover, gear comfort still plays a role in the safety of kite surfers and is important with regard to preventing injuries [6].

We collected data regarding the epidemiology of kite surfing injuries in Israel, explored the distribution of these injuries in the body with the aim of raising awareness among emergency department personnel, and propose precautions to avoid incapacitating and potentially life-threatening injuries.

PATIENTS AND METHODS

We retrospectively collected details of injuries that occurred during kite surfing for the period 2000 to 2013. A public appeal was published on the internet calling for kite surfers to report any injury that was related to kite surfing. The appeal was published on local web sites and web forums popular among water sports athletes including kite surfers. The surfers were asked to include all injuries related to every specific occasion. The study received approval from the local Helsinki ethics committee of the hospital.

The National Center for Trauma and Emergency Medicine Research at Gertner Institute records all trauma injuries requiring hospitalization in Israel in the Israeli Trauma Registry (ITR). We asked the center to search for all kite surfing injuries reported to its registry. We could not search the electronic databases of local hospitals for kite surfing injuries since no ICD-9 related codes (International Statistical Classification of Diseases and Related Health Problems) appear on their lists. The data gathered included age, gender and injury site. Data received from the ITR also included Injury Severity Score (ISS). Although not very detailed, the data collected shed light on the potential dangers of this relatively new water sport and the disabling injuries that surfers might face.

RESULTS

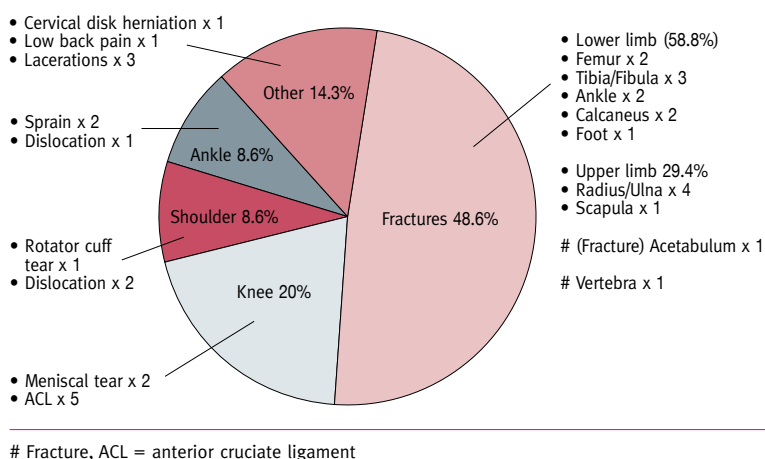
Twenty-nine kite surfers responded to our call on the web, reporting 41 events of injury related to kite surfing. The first report dated back to 2000. The ITR search yielded seven major individual cases of kite surfing injury that occurred during the period 2002–2013. Two of these were fatal due to severe head injury. Overall, 36 individuals were included in our survey. The total number of injuries reported by the internet appeal and the Gertner Institute database was 48. Mean age was 31 years (range 12–67), with the majority (92%) of athletes being males.

Table 1. Distribution of kite surfing injuries based on body site

Body region	Distribution of injuries (%)	Detailed description*
Musculoskeletal	72.9	See Figure 2
Head injuries	18.7	Concussion (2) SDH (1) SAH (1) Skull fracture (2) Scalp laceration (3)
Chest injuries	14.6	Contusion (4) Rib fractures (3)
Miscellaneous	10.4	Laceration of lip (2) Laceration of ears (2) Broken tooth (1) Broken nose (1)

*Number in parentheses signifies the number of injuries
The total is greater than 100% due to multiple injuries on the same occasion
SDH = subdural hemorrhage, SAH = subarachnoid hemorrhage

Figure 2. Distribution of orthopedic injuries from kite surfing



Nine surfers (25%) reported more than one occasion of injury. On the other hand, surfers reported 1.14 injuries per occasion, which means that only in a few cases were there multiple injuries per occasion. Two surfers died due to severe head injuries, including skull fractures and intracranial hemorrhage.

Most injuries were related to the musculoskeletal system (72.9%). Other relatively common injuries were head and chest injuries. The distribution of injuries is outlined in Table 1. As mentioned, orthopedic injuries accounted for most of the cases [Table 1 and Figure 2]. Of these, 17 (48.6%) were fractures, the majority (58.8%) being fractures of the lower limbs, followed by the upper limbs (29.4%), comminuted fracture of the acetabulum (5.9%, one case) and vertebral fracture (5.9%, one case). Only two cases (11.7%) were open fractures. The most common injury around the knee was tear of the cruciate ligaments. The most common injury of the upper limb was shoulder dislocation. Injuries to the lower limbs (fractures and soft tissue injuries including ligaments) were most common overall (45.8%).

DISCUSSION

This male predominated extreme water sport is potentially dangerous, with musculoskeletal injuries – ranging from minor injuries such as ankle sprain to major fractures such as femur and acetabulum – being most common among the athletes. Most musculoskeletal injuries are injuries to the lower limbs, which is supported by previous studies. A re-injury rate of 25% could not be overlooked, but as noted above most are isolated injuries rather than polytrauma.

Our results reveal only a tip of the iceberg, since most injuries are not recorded properly in the emergency department's electronic records or in the database of the National Center for Trauma and Emergency Medicine Research. Furthermore, our internet appeal was not met with much enthusiasm.

In our opinion, the main reason for under-reporting of such injuries in the hospitals' digital records is the lack of specific codes for kite surfing injuries in the ICD-9 injuries list, resulting in an underestimated prevalence of kite surfing injuries. This is true for many other athletic activities. Additionally, cases reported to the National Center for Trauma and Emergency Medicine Research are only of injuries requiring hospitalization. This contributes to lack of accurate reporting.

CONCLUSIONS

Based on our findings, we advise the following precautions:

- **Head helmets:** Severe head trauma reported here highlights the need to wear helmets as a standard safety precaution. Commercially made helmets are now available at low cost; they are easy to wear and do not narrow the surfer's visual field.
- **Impact and life vests:** Chest injuries, including rib fractures, stress the importance of wearing these life-saving items, which in addition to preventing direct chest injury keep the surfer afloat. A surfer afloat may also capture the attention of fellow surfers.

- **Wetsuits:** The importance of wetsuits cannot be overemphasized especially between seasons when athletes tend to dismiss their use as unnecessary. Wetsuits can save lives when an injured surfer is waiting for rescue while immersed in water for a long time.
- **Other precautions:** Although most injuries are of the musculoskeletal system, there are no specific precautions that can be taken. Hence, adjustment of the surfer's skill level to the current weather conditions, using a fast-release system to detach from the kite, and safety hook knives to cut the strings, are all necessary to prevent or lower injury rates.
- If needed, gloves, foot protection, and of course sunscreen, should be used.

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