

## Injury pattern due to falls from hunting stands

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### Abstract

Hunting is a historically constructed cultural act and continues to be a passion and a popular recreational pastime worldwide. Along with a high population density in Europe and a large volume of hunters hunting injuries such as falls from hunting stands continue to occur regularly and are a significant cause of morbidity among hunters. The purpose of this study was to review typical injury patterns after falls from hunting stands in Germany between 2000-2009 using the German agricultural statutory accident insurance database and to compare these findings to other causes of hunting accidents. The most common injury pattern after falls from hunting stands in Germany in the period of 2000-2009 are closed fractures. However, data collection is incomplete. Thus a more precise data collection would help to be able to better analyze accident mechanisms in order to be able to prevent further accidents.

### Introduction

*The thrill of hunting consists in the fact that it is always problematical because it is not essentially for the hunt to be successful.*<sup>1</sup> With this remark Jose Ortega y Gasset, one of the greatest cultural philosophers of our times tries to describe the ambivalence of the hunters attitude: On the one hand his loving relationship to the natural flora and fauna and on the other hand the will of chasing and killing the game, which can not always be successful. Very often the hunter comes home preyless, he returns bredouille, but nevertheless with another unique personal experience of outdoor life. Additionally to the pursuit aspect the idea of preserving and taking care

of the wildlife creatures and their surrounding is an important challenge and task for today's hunters.

Hunting in Germany is a popular outdoor activity and it is mainly seen as a certain attitude of life rather than a sports activity (Figure 1). Referring to the German national hunting company (Deutscher Jagdschutzverband, DJV) there were approximately 350.000 licensed hunters in the hunting year 2009/2010,<sup>2</sup> 82% of them (about 286.000) are members of the DJV. Seen the population of the whole country (approximately 82 million) there is a percentage of about 0,42% hunting enthusiasts (relation of 1 hunter:234 inhabitants). Compared to other European countries e.g. like France (62 million inhabitants; about 1,4 million hunters = 2,25% of the population, relation 1:44) it is a quite rare pastime.<sup>3,4</sup>

Hunters usually classify the huntable wildlife animals into small (e.g. pheasant, partridge, rabbit, hare etc.) and big game (wild boar, red deer, bear etc.). The various different hunting techniques used for both of them include elevated platforms, so called hunting tree stands (mainly in North America) or hunting stands/high seats (Germany, Europe) (Figure 2). Both of them allow the hunter an expanded field of vision, decrease human scent dispersion at ground level, and lessen the chance of being seen by the game.

In Germany and North America there are several types of hunting stands available, some are commercially manufactured, and others are constructed by the hunter. Mainly in North America there is also a variety of *climber* and *locked-on* models constructed of one or two pieces that permit the hunter to ascend to the desired height.<sup>5</sup>

Tree stands are built in or attached to trees with access provided by a self-constructed wooden ladder, rail spikes, or wooden steps nailed onto the tree trunk. The in Germany more often used high seats however are in most cases homemade or industrially preformed wooden bar constructions with a platform on the top and a so called pulpit nailed on it. Through the surrounding windows the hunter can observe the ground around him. Other kinds of high seats are for example wooden ladders with a small seat on it that rest against tree trunks. All of those constructions are typically placed between 15 and 30 feet above ground level, although there is a certain variation of height depending on the hunters needs.<sup>5</sup> Safety harnesses especially for tree stands are straps attaching the hunter to the stand and are intended to reduce the likelihood of falls.<sup>7,8</sup>

Thinking about hunting related accidents there is above all the concern about the number of firearm injuries, which are well known and widely described.<sup>9,10</sup> In general, hunting-related injuries are often thought to be associated with an intoxicated hunting companion

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who has a *happy trigger finger*, which is a contention often sensationalized by the press. Throughout the last years the dangers of hunting tree stands have already been characterized in the American Medical Literature. In a retrospective study of patients involved in hunting related accidents Crockett *et al.* demonstrated that in the Midwestern USA tree stands and not firearms were the main cause of heavily injured hunters and that alcohol consumption seemed uncommon among hunters who fell.<sup>11</sup> Other authors also describe falls as the most common way for hunters to be injured.<sup>5</sup> It is estimated that about 10% of hunters who use tree stands are injured annually and more than 75% of tree stand injuries occur during use of fixed positions or climbing stands.<sup>12</sup> Falls from tree stand heights are associated with high morbidity, in the study of Crockett *et al.* 80% of the fall victims underwent operative intervention and nearly 10% had permanent neurologic deficits. Common fall sequelae were spinal injuries, lower extremity fractures including the hip joint, and traumatic brain injuries. The severity of the injury pattern after falls is explainable seen the height of the stand (mostly 15 to 30 feet) and the fact that the body can reach impact velocities of up to 30mph. Other factors that influence the type and amount of trauma include the time duration and orientation of the body at impact, the landing surface, the time duration of impact, the distribution of force, secondary impacts, and age and physical condition of the patient.<sup>11,13,14</sup> As Lowenstein *et al.* already described the height of the fall directly influences the velocity of impact. The maximum impact velocity or terminal velocity is limited largely by air resistance and for the human body is approximately 120 miles per hour and requires a height of 480 feet at sea level.<sup>13,14</sup> Hunters falling from trees can also sustain secondary impacts with tree limbs.

These secondary impacts affecting the body orientation at final impact can cause additional injuries and can also reduce the final impact velocity.<sup>13</sup>

The incidence of tree stand falls is difficult to determine because many falls happen unreported. Deaths occur, but infrequent.<sup>5,6,13-16</sup>

In the current study we retrospectively look at injury patterns after falls from hunting seats in Germany in the years 2000-2009. The used data was presented by the German agricultural statutory accident insurance company (*Landwirtschaftliche Berufsgenossenschaft, LBG*), a federal insurance institution responsible for the prevention, protection and medical treatment of patients involved in accidents while working professionally in jobs on the rural site like farmers, forest rangers, professional hunters etc. Because of the lack of an obligatory registration of hunting accidents in Germany most cases might remain unreported and neither the exact anatomical injury sight nor a follow up of patients reaching a local trauma center can be given. A helpful tool to estimate the number of hunting related accidents and to ensure a follow up of patients concerned may possibly be the recently erected trauma registration of the German Society of Traumatology (DGU, Traumaregister).

## Materials and Methods

For the presented retrospective study data was given by the LBG, the German agricultural statutory accident insurance company concerning the total number of hunting-related accidents from 2000-2009 and especially those with hunters involved in falls from hunting stands/high seats. There were in total 8563 reported cases of hunting-related accidents, 684 of them due to falls from the height of a high seat/hunting stand. The LBG confirmed a total amount of 51 deaths, 6 of them due to falls from hunting stands. The data included apart from the pure number of cases a superficial overview of the anatomopathology of the injuries without giving details about the precise body location. Unfortunately there was no information about age, gender, comorbidities, height of fall, time until presentation to emergency department, medical treatment including emergency room treatment, precipitating causes, exact anatomical level and type of injury, associated injuries, time of hospitalization and patient outcomes.

## Results

In the years 2000-2009 there were 8563 cases of hunting related accidents reported to the LBG

in Germany. 684 of them were reported as falls from hunting stands. Most injured persons have been counted in the year 2002 (1009), 102 of them after hunting stand falls. Throughout the years there were in total 51 deaths, 6 of them due to falls from hunting stands. The most common injury pattern were superficial soft tissue injuries/ skin injuries (1978) followed by concussions (1466), closed fractures without further anatomical detail (1139), dislocations/luxations (1000) and penetrating of foreign bodies (477). Looking at the injury pattern after falls from the height of a hunting stand closed fractures were the most common injury sequelae (245) followed by concussions (172) and dislocations/luxations (82).

Firearm injuries occurred in 85 cases (0,99% of the total amount of hunting related accidents) and ended deadly in 11 (12,9%). The fatalities due to falls from hunting stands (6 of 684) make up 0.87% of this entity compared to 0,07% seen the total amount of hunting accidents. Most of the hunting related injuries happened in the year 2002, both the total amount (1009) and the amount of hunting stand falls (102). The years to follow are 2003 (971/ 72) and 2001 (912/ 84). In the year 2004 most of the hunting fatalities occurred (11), followed by 2008 (10). 2008 has also been the year with the highest amount of deathly injured persons by falls from hunting stands (3). Constrictively we have to say that the results are preliminary and that the estimated number of unreported cases is much higher.

## Discussion

In the current study we present the available descriptive epidemiology of hunting stand related injuries in Germany in the past decade. To the best of our knowledge there is no other study describing the amount or injury pattern after falls from hunting stands. We compare our findings to American studies, that deal much more often with this subject.

As we could see from the LBG data closed fractures including the lower extremities made up the most common injury pattern due to hunting stand falls. This is consistent with other studies demonstrating a similar injury pattern.<sup>6,8,15</sup> The often injured lower extremity can be explained by hunters trying to land on their feet after they fall. This is also consistent with previous studies that suggest fractures to be the most significant type of injury associated with most body locations<sup>6,7,8,15</sup> and consistent with falls from a substantial height.<sup>17</sup> Spinal fractures are also a very common injury pattern and play a significant role, often associated with concomitant neurologic injury, extended hospitalization, and permanent disability. Up to 33% of spinal injured hunters are perma-

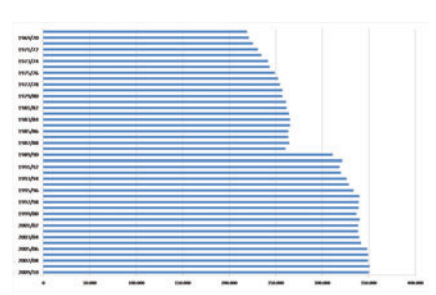


Figure 1. Number of Hunters in Germany. Note: German re-union of East and West-Germany in 1989/1990.



Figure 2. Typical hunting stand/ high seat in Germany

nently paralyzed as a result of their accident.<sup>5,17</sup> Regarding the age of hunters involved in accidents there is evidence, that younger hunters are more likely to be injured in general.<sup>18</sup> As Terry *et al.* described in 2010 25-34 year old hunters have a higher injury rate although only 17% of hunters in the USA are in this age group and nearly half of hunters are aged between 35 and 54 years.<sup>7</sup> Regarding the German LBG database on hunting accidents we see according to Crockett *et al.*<sup>11</sup> a higher rate of injuries due to falls than to firearm accidents. Falls occur much more often, but they are not as lethal as firearm injuries.

Within the presented data of the LBG we found no evidence on alcohol being cause of hunting injuries, although previous research showed that it is a possible cause of hunting stand-related accidents, because it both decreases the perception, balance and concentration needed to operate a hunting stand correctly and to increase the risk of falls.<sup>6,8,19</sup> However, evidence suggests that only approximately 10% of hunting stand-related injuries might be attributed to alcohol.<sup>6,8,15</sup>

During the thorough 9 month hunters training in Germany which ends with an exam over 3 days the aspirant learns among other things some theoretical and practical aspects of outdoor constructions such as hunting stands, ladders etc. Nevertheless hunting stand safety regulations must be a higher priority for hunters as well as manufacturers of hunting stands, because it is estimated that 30 per cent to 50 per cent of all hunting stand falls are attributable to failure of the stand, and failure seems to be more common in homemade stands than in commercially available stands. Although mechanical failure of hunting stands may be the most common preventable cause of these falls other factors could contribute to falls from these platforms like small platform size, darkness, fatigue, exposure to environmental extremes, user inexperience, less commonly drug or alcohol abuse.<sup>11</sup> In Germany the legal hunting day for large game from a hunting stand begins 1 hour before sunrise and ends 1 hour after sunset except for wild boars, that can also be hunted during nighttime. Therefore darkness may compound the difficulty of ascending to or descending from a tree stand. After successfully mounting their stands deer hunters often remain perched on these tiny platforms for hours, holding a weapon and enduring variable weather conditions.<sup>11</sup> In many states of the USA hunters education includes a mandatory hunters safety course with a special dedication to tree stand safety. Most commercially available tree stands warn hunters of the risk of falls and recommend the use of safety straps while ascending, sitting, and descending from the stand. At present all manufactured new tree stands in the USA come equipped with safety harnesses, but it is unknown what percentage of hunters are using these arrest systems.<sup>11</sup> Nevertheless hunters should be properly educated on the safe and proper use of these stands including besides the use of safety harnesses a regular maintenance of the stands, and for those hunters who prefer to build their own stands, proper instruction on construction of stands.<sup>17</sup>

## Conclusions

Although hunting stand-related injuries are

a major cause of morbidity among the hunting population they are preventable.<sup>7</sup> Aggressive hunter education programs should help reduce the incidence of these potentially serious accidents while focusing on safe climbing techniques, use of safety equipment and abstinence of alcohol while hunting. Additionally hunting stands should not be used by persons with medical conditions that may predispose them to an increased risk of falling down.

For the local situation in Germany it is desirable to have a more precise registration of the circumstances of hunting accidents including the above mentioned aspects, exact anatomical injury region of patients, and information about the further medical treatment. These informations given future prevention of severe hunting accident sequelae may be much easier. Further study efforts in this direction are surely helpful. Proposing this we fully acknowledge the limitations of a retrospective epidemiological study, but on the other hand the nature of the mechanism of injury and the individuality of each injury prevent a thorough prospective randomized analysis.

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