

CASE REPORT

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Traumatic Asphyxia in Weightlifters

ABSTRACT: The cases presented here are an unrecognized source of accidental asphyxia—compression of the neck by barbells. Two cases of traumatic asphyxia due to this preventable hazard occurred in a 5-year period in central New York. There have been at least 11 similar deaths reported to the United States Consumer Product Safety Commission (CPSC) and cataloged in the National Electronic Injury Surveillance System between 1999 and 2002. A petition filed in 2003 with the CPSC-proposed mandatory labeling of bench presses to make consumers aware of this hazard, but was denied. This report looks at the deaths that have occurred due to this unrecognized safety threat and provides pertinent advice to make bench-pressing a safer activity.

KEYWORDS: forensic science, traumatic asphyxia, weightlifting, safety hazard

Unintentional (accidental) injuries were the primary cause of death in 2002 for people under 35 years of age according to the National Center for Health Statistics (1). Asphyxial deaths comprised 12,791 of the 161,269 total accident fatalities, nearly 8% (1). Asphyxia causes death quickly, and even when interrupted, may lead to permanent brain anoxia. Individuals may not recognize any compromise to their safety when they enter into a potentially dangerous activity. However, warning labels and education can have an impact in raising awareness of hazards and influence behavior (2,3). Most asphyxial deaths, by their very unintentional nature and involvement by an outside material, are imminently preventable if the hazardous situation is recognized and avoided or safeguarded against.

The CPSC has played an important role in the public recognition of asphyxial hazards. They have been involved with mandatory and voluntary equipment labeling, product recalls, and public/community alerts and education. Some specific types of equipment that the CPSC have focused attention in include playground equipment and drawstring hoods, collapsible soccer goals, and cribs (4). However, one arena that has not received much attention is weightlifting equipment, particularly bench presses.

Background

Weightlifting as a competitive sport and for those desiring resistance training for preventative and maintenance health issues has increased tremendously in popularity in recent years. Body image is important to people and indeed both competitive bodybuilders and noncompetitive weight trainers reported more satisfaction with their upper torso and muscle tone than did an athletically active control group (5). This sport also increasingly involves children as the notion of the harmful growth effects of weightlifting is dispelled (6). The National Sporting Goods

Association claimed that in 2005 over 35 million people in the United States participated in some form of weightlifting, which was the fastest growing fitness activity (7). In addition, there are an estimated 6–9 million bench press benches in use both in homes and in gyms with a vast majority for personal domestic use (8).

The number of reported injuries related to this sport has increased as well (9) and was responsible for 9901 emergency room visits for head injury in 2004 (10). Most of these injuries involve musculoskeletal trauma, particularly to the upper extremities (11,12), and also spontaneous pneumothoraces (13). Rare reports of cardiovascular injury resulting in death have been reported (14), some of which involve the concurrent use of anabolic androgenic steroids (15).

There is a voluntary standard that has been published by the ASTM International (ASTM F 1749) that requires a general warning label for fitness equipment and fitness facility safety signage and labels (16). This does not specifically address bench presses or the asphyxia/anoxia hazard. Indeed this warning recommends knowing the proper use of the equipment. Recommendations for safe use of a bench press requires having a spotter behind the person who is lifting to prevent the barbell from landing on the lifter's chest or neck if the lifter's muscles give out. There are also equipment features that might assist with safety if someone is working out alone, such as a Smith machine (www.bench-press.net), portable pneumatic safety presses (www.safetybenchpress.com), and other devices (www.weightspotter.com) (17).

Materials and Methods

A review of all accidental asphyxial deaths from 2001 through March 2006 for a four-county region in central New York revealed a total of 48 fatalities. A majority of these cases were drowning (18), fire related (10), choking/aspiration (9), entrapments (8), inhalant abuse (2), and mechanical ventilator failure (1). Of these, two entrapment deaths were related to neck compression from weightlifting on a bench press.

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FIG. 1—Photograph of weightlifting bench and work out room from Case 1.

The autopsy and investigative reports and scene examinations of these two cases were all carefully reviewed.

Case Reports

Case 1

The decedent was a 33-year-old male who was found dead in a friend's workout room, supine on a weightlifting bench with a barbell across his neck and a total of 425 pounds of weight (evenly distributed on each side of the bar) (Fig. 1). He was last seen alive *c.* 1 h earlier when he went to work out. The decedent had been practicing for a power lifting competition to take place in 4 days and had previously lifted up to 500 pounds. Past medical history was pertinent for instability and subluxation of the right shoulder and lower back muscle strain due to weightlifting.

The decedent was 68½ in. in height and weighed 235 pounds. The head and neck were suffused pink/purple with a patch of sparing on the anterior neck, two small dried indentations < 1/4 in.



FIG. 2—Photograph of face and neck of decedent from Case 1 with visible facial petechiae.



FIG. 3—Larynx from Case 1 with hemorrhage in soft tissue and edema of mucosa.

in the greatest dimension each and one located at the level of the thyroid cartilage and the other on the left side of the neck. There was also diffuse facial and conjunctival petechiae (Fig. 2). Internal examination revealed extensive hemorrhage into the soft tissue and anterior strap muscles of the neck including the thyrohyoid and cricothyroid muscles as well as extensive submucosal hemorrhage and edema in the posterior pharynx and glottis, and extensive edema of the epiglottis noted on the oral surface (Fig. 3). Death was attributed to asphyxia due to blunt trauma and compression of the neck by barbell. Toxicology testing revealed the presence of over-the-counter medications—ephedrine, ibuprofen, and phenylpropanolamine—at nontoxic concentrations. There was no reported use of anabolic steroids.

Case 2

The decedent was a 16-year-old male who was found dead in his room supine on a weightlifting bench with a barbell across his neck and a total of 72.6 pounds of weight (equally) distributed between each side of the bar (Fig. 4). The decedent had stayed home from school on the day of his death for unknown reasons. He was last seen alive by his mother 2 h before being found. There was no significant past medical history. The decedent had been lifting weights for the previous 2 months and had not had any formal training.

The decedent was 64 in. in height and weighed 102 pounds. The anterior neck and right shoulder revealed distinct indentations from the bar (Fig. 5). Petechiae were noted in the conjunctivae. The findings in the larynx were less impressive than the previous case and consisted of petechiae in the upper airway and epiglottis (Fig. 6). Death was attributed to asphyxia due to compression of neck due to weightlifting barbell. Toxicology testing was completely negative.

Discussion

The two reported deaths emphasize the hazards of weightlifting from a bench press without equipment safety guards or a human spotter present. When the chest and upper extremity muscles fatigue, there is the risk of the barbell and weights coming to rest on



FIG. 4—Photograph of weightlifting bench and barbell from Case 2.

the neck or chest of the lifter. Once this happens, the person may suffer fatal traumatic asphyxia, either due to compression of the airway, neck vasculature or chest muscles of respiration.

A petition requesting labeling of weightlifting bench press benches to reduce or prevent deaths due to asphyxia/anoxia was proposed in July 2003 following a review of NEISS data from 1999 to 2002 that revealed 11 deaths due to traumatic asphyxia by this same instrument (18). After consideration of the request, the CPSC felt that “bench press benches without the requested labeling” do not present an “unreasonable risk of injury” (19).

It is understandable that all recommendations considered on a federal level must involve a cost/benefit analysis. Fatal incidents are rare; however, they are a completely preventable cause of death. As weightlifting increases in popularity and use, the number of fatal incidents will surely increase. Being proactive before the number of fatalities rise to the level of being cost effective to warn consumers about this hazard is unfortunate.

It is clear from these two case reports, that this safety hazard can involve novice bench press users or experienced competitive

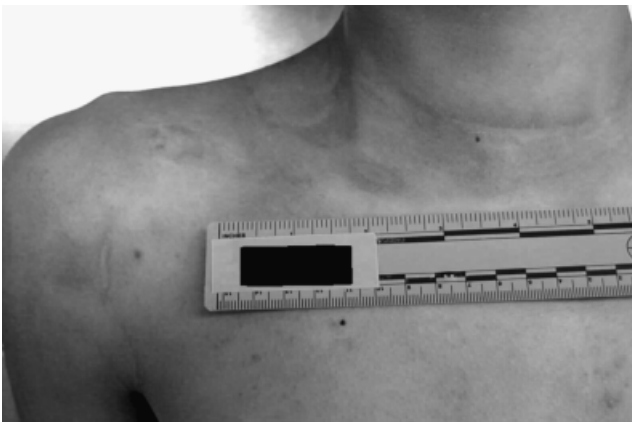


FIG. 5—Neck and shoulder of decedent from Case 2 showing distinct indentations.

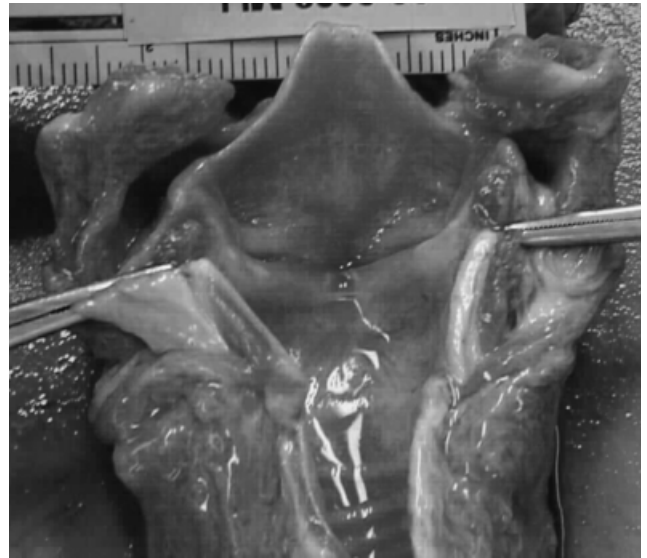


FIG. 6—Larynx from Case 2 with mucosal petechiae noted.

weightlifters. Each lifter may overestimate their abilities to lift a certain quantity of weight based on inexperience or prior ability. The lifter may underestimate the potential hazard and be naïve about their ability to avoid it or be unaware of any lethal consequence. In addition, even if the lifter is aware of a potential hazard, they may think they can call out for nearby help if they get into muscle fatigue. They may not realize that air exchange is required across the vocal cords to vocalize and this is not possible. They may not consider the immediate surroundings around the bench press itself so that tipping the weight off sideways is hampered—a method anecdotally recommended for solo bench press users.

Conclusion

Public health places a high value on preventative actions. This form of death is completely preventable and might be addressed by procedures that take into account the human factor. Sports physicians, coaches, and others advising competitive athletes might educate these same athletes. Public education, warning labels on the bench press, and fail-safe mechanisms for equipment might also be considered. The current general warnings for fitness equipment are so vague that they are not useful in depicting the clear hazard of death due to asphyxia that these bench presses present.

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