



### **D25 Vaginal and Colorectal Injuries From a Personal Watercraft Jet Stream Versus Falling Into the Water at Speed**

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The goal of this presentation is to demonstrate, with a case study and analysis of the relevant literature, how vaginal and colorectal injuries caused by the high-pressure water jet emitted by personal watercraft become more severe with increasing power of these machines and how the pattern of these injuries differs from those typically observed due to falling into the water at speed.

This presentation will impact the forensic science community by demonstrating how the severity and type of vaginal and colorectal injuries can differ due to proximity to the high-pressure water nozzle of personal watercraft versus entering the water at speed by falling off a craft but not landing near the nozzle.

A Personal Watercraft (PWC) is generally defined as a vessel which uses an inboard motor powering a water jet pump as its primary source of motive power. The majority of PWC's manufactured in the United States are designed to be operated by a person sitting on the vessel in a straddled configuration, like a snowmobile or a motorcycle. According to the United States Department of Transportation, 1.2 million PWC's were in use in the United States in 2014. Since their advent, PWC's have become faster and more powerful. Current models can have 300HP engines and the pressure from the water jet emitted from the PWC nozzle can exceed 800psi.

Although relatively rare, serious orifice injuries may occur to the vagina, perineum, anus, rectum, or colon when the rider or passenger of a PWC falls (or is ejected) from the back of this watercraft and lands in proximity to the nozzle with both legs abducted, such that these anatomical structures are directly in the path of the PWC's high-pressure water jet.

A case study is presented whereby two young women (a 17-year-old female seated immediately behind the operator and a 16-year-old female seated behind the 17-year-old) were passengers on a 2007 model year PWC. When the 21-year-old male operator accelerated rapidly from rest with no warning, both female passengers (wet from prior water immersion) were ejected from the rear of the PWC. They landed in the water near the jet nozzle, each with both legs abducted. The 17-year-old sustained a 6cm defect at the left pararectal space inferior to the vaginal mucosa; detachment of the perineal body; a 5cm-long vaginal laceration extending caudally along the left lateral posterior vagina, and a 4cm superficial deficit in the left ischioanal fossa. The 16-year-old sustained a significant anal tear at the midline 12:00 o'clock position anteriorly and completely through the internal and external sphincter, as well as a posterior anal tear through the interior and external sphincters.

A question that often arises in litigation related to PWC orifice injuries is whether the injuries were more likely to be caused by the pressure from the jet nozzle or if it would have occurred regardless, due to falling into the water while traveling at a given velocity.

Freeman, et al. reported that the average New Injury Severity Score (NISS) a scale based on threat-to-life values for reported PWC falls and other water sports and activities was about half of those values reported for PWC jet nozzle injuries.<sup>1</sup> This study adds to that database by analyzing the extent and type of injuries reported in the literature and in the subject case to determine if certain types of injuries are more likely related to the jet stream or



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simply falling into the water at speed. By examining the structures disrupted and the severity of each disruption, it may be evident that more force would be required to produce a given injury, even if threat-to-life is not increased. For example, it would take more force or pressure to lacerate the tough fibrous anal sphincter than to make a tear in the inner wall of the colon or vagina.

Analysis of the injuries from this case study, together with a review of similar injuries in the literature, lead to the conclusion that as power and thrust of the PWC increases, injury patterns will become less like those typically seen from falling into water at speed and the severity of injuries observed will increase.

### Reference(s):

1. Freeman M.D., Everson T.M., Kohles S.S. Forensic Epidemiologic and Biomechanics Analysis of a Pelvic Cavity Blowout Injury Associated with Ejection from a Personal Watercraft (Jet-Ski). *J Forensic Sci.* 2013;58(1):237-244.

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### Personal Watercraft, Colorectal Injury, Vaginal Injury