## G42 Discrimination of Falls and Blows in Blunt Head Trauma: A Multi-Criteria Approach

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After attending this presentation, attendees will have better knowledge of the criteria pointing towards blows or falls in blunt head trauma.

This presentation will impact the forensic science community by providing tools to improve the discrimination between falls and blows.

The distinction between accidental falls and homicidal blows is an important one in forensic pathology as it occurs frequently, but most importantly, because of the legal branching related to a homicide. Indeed, autopsy findings are often used to corroborate or complement investigative information. In the discrimination of falls versus blows, the hat brim line (HBL) rule is mentioned in several textbooks as the most useful single criterion. According to this rule, an injury located at the level where the brim of a hat would lie is more likely the result of a fall, while a blow would generally produce a wound above this line. Recent studies however have found that the HBL rule is only moderately valid and that its use on its own is not recommended. The HBL rule should instead be used in conjunction with other tested criteria, such as the side lateralization and number of lacerations and the length of lacerations. The purpose of this research is first to find additional individually useful criteria in the distinction of falls from blows, and second to construct a decision tree by selecting and combining criteria with the highest predictability rates.

**Materials and Methods:** This retrospective study used autopsy cases from the Montreal Laboratoire de sciences judiciaires et de médecine légale spanning a six-year period (2000-2005). The selected cases represented falls downstairs, falls from one's own height and homicidal blows to the head by a blunt weapon. Designation of cases as falls or blows was not solely based on head examination but on a thorough case review, including scene investigation, witness testimony, perpetrators confession and other autopsy findings. The cases where a victim was struck while lying on the ground were excluded from the sample. For each case, the following features were compiled: the number of lacerations, the location of lacerations and fractures in relation to the HBL, the side lateralization of lacerations and fractures, scalp laceration length; calvaria fracture type; number of facial abrasions, contusions, and lacerations (including mouth lesions); presence of lacerations on the ear; presence of facial fractures; pattern of post-cranial

osseous and visceral trauma; and the quantity of alcohol (mg/100ml) when toxicology reports were available. The HBL definition used in this study is the following: the area located between two lines parallel to a line inspired by the Frankfort horizontal plane (horizontal plane passing through right and left porion points and the left orbitale), the superior margin passing through the glabella (G line) and the inferior margin passing through the center of the external auditory meatus (EAM line).

**Results and Conclusion:** A total of 113 cases were studied: 29 cases of falls from one's own height, 21 cases of falls downstairs, and 63 cases of homicidal blows. Cases of falls downstairs revealed a male:female ratio of 6:1 with an average age of 50 (± 14.3 years ranging from 26 to 79 years), while the ratio for falls from one's own height was 8.7:1 with an average age of 51.5 (± 17.5 years ranging from 15 to 85 years). Cases of blunt head trauma to the head showed a male:female ratio of 2.9:1 with an average age of 44 (± 19.8 years ranging from 9 to 81 years).

The goal of this study was to improve the discrimination between falls and homicidal blows by a blunt weapon in a forensic pathology setting. The request to give an expert opinion on this distinction is a common and crucial one given the legal consequences. Overall, based on the present study as well as previous ones, the criteria pointing towards blows are:

1. More than three lacerations
2. Laceration length of seven cm or more
3. Comminuted or depressed calvarial fractures
4. Lacerations or fractures located above the HBL
5. A left side lateralization of lacerations or fractures
6. More than four facial contusions or lacerations
7. Presence of ear lacerations
8. Presence of facial fractures
9. Presence of post-cranial osseous and/or visceral trauma

**Blunt Head Trauma, Falls, Homicide**

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