

## INJURY MECHANISMS FOR ACL INJURIES IN TEAM HANDBALL - A VIDEO ANALYSIS

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**Introduction:** ACL injuries are very common in Norwegian team handball, in particular among female players (Myklebust et al 1998). Studies based on interviews of injured players show that most of the injuries occur in a movement the players have done many times before, often in a faking/cutting movement or landing from a jump, and apparently without direct body-contact. However, observational studies of the injury mechanisms for ACL injuries are currently not available. The purpose of this study was to analyse the injury mechanisms for ACL injuries in female players based not only on player recall, but also analysis of video-taped injury situations.

**Methods:** ACL injuries in 60 semi-professional or amateur teams (920 players) in the three upper divisions for women in Norwegian team handball were registered during the 1998-99 season. All the injured players were interviewed personally or on the telephone based on a standardised questionnaire. Videos of ACL injuries were also collected at systematic search of Norwegian TV station archives and through contacts in the handball environment. The videos were digitized and enhanced to clearly show the accident. Three knee experts (MDs with ACL research experience) and three handball experts analysed the videos independently in order to describe the injury mechanisms and playing situations. **Results:** We found 32 ACL injuries during the 1998-99 season. Of these injuries, 24 (75%) occurred during competition, 27 (84%) occurred in the attacking phase, 19 (59%) occurred during faking/cutting movements and six (19%) occurred when landing from a jump. Twenty (63%) of the injuries occurred in non-contact situations. We were able to locate 12 videos of ACL injuries from Norwegian and International competitions in the period 1988-1999, five of these were from the last season. Of these 12 injuries, 11 (92%) occurred in the attacking phase. Eight (67%) were described as uncommon situations. Five (42%) of the players were in opponent contact, four were pushed, directly before the injury occurred and four (33%) were in opponent contact, three were pushed, at the time of injury. Nine (75%) occurred during faking/cutting movements; five (56%) were two-legged and four (44%) were one-legged, seven (78%) did a right-left faking/cutting movement; five (71%) of these had right side injuries. The knee position at the time of injury were for all nine in flexion and valgus, five (56%) in external rotation of tibia and four (44%) in internal rotation. Two (17%) occurred when landing from a jump, both with the knee in extension, external rotation of tibia and valgus, and take-off and landing were done using their injured leg. All these 11 injuries occurred at the time the foot were planted on the floor and ten (91%) occurred with the foot far outside the knee.

**Discussion and conclusion:** The questionnaire data correspond closely to injury mechanism data from earlier studies by Myklebust et al., and the video injuries appear to be a representative sample when comparing with questionnaire data. We found two possible injury mechanism for ACL injuries in female players in team handball. The most usual injury mechanism, faking/cutting movement, occur in every cases with a forceful valgus-external or internal rotation with the knee in some flexion. Some of these injuries could also have been occasioned from external influence, like a push from an opponent. In the other injury mechanism, landing from a jump, it seems to be the one-leg-landing with a forceful valgus-external rotation with the knee in extension that may have occasioned the ACL injury. In both these two injury mechanism the foot was planted on the floor and in nearly all the foot were far outside the knee.

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