Management of Femoral Neck Stress Fractures at a Specialist Centre and Predictive Factors to Return to Activity Time: An Audit

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Abstract : Background: Femoral neck stress fractures (FNSF) are uncommon, making up 1 to 7.2% of stress fractures in healthy subjects. FNSFs are prevalent in young women, military recruits, endurance athletes, and individuals with energy deficiency syndrome or female athlete triad. Presentation is often non-specific and is often misdiagnosed following the initial examination. There is limited research addressing the return–to–activity time after FNSF. Previous studies have demonstrated prognostic time predictions based on various imaging techniques. Here, (1) OxSport clinic FNSF practice standards are retrospectively reviewed, (2) FNSF cohort demographics are examined, (3) Regression models were used to predict return–to–activity prognosis and consequently determine bone stress risk factors. Methods: Patients with a diagnosis of FNSF attending Oxsport clinic between 01/06/2020 and 01/01/2020 were selected from the Rheumatology Assessment Database Innovation in Oxford (RhADiOn) and OxSport Stress Fracture Database (n = 14). (1) Clinical practice was audited against five criteria based on local and National Institute for Health Care Excellence guidance, with a 100% standard. (2) Demographics of the FNSF cohort were examined with Student's T-Test. (3) Lastly, linear regression and Random Forest regression models were used on this patient cohort to predict return–to–activity time. Consequently, an analysis of feature importance was conducted after fitting each model. Results: OxSport clinical practice met standard (100%) in 3/5 criteria. The criteria not met were patient waiting times and documentation of all bone stress risk factors. Importantly, analysis of patient demographics showed that of the population with complete bone stress risk factor assessments, 53% were positive for modifiable bone stress risk factors. Lastly, linear regression analysis was utilized to identify demographic factors that predicted return–to–activity time [R2 = 79.172%; average error 0.226]. This analysis identified four key variables that predicted return-to-activity time: vitamin D level, total hip DEXA T value, femoral neck DEXA T value, and history of an eating disorder/disordered eating. Furthermore, random forest regression models were employed for this task [R2 = 97.805%; average error 0.024]. Analysis of the importance of each feature again identified a set of 4 variables, 3 of which matched with the linear regression analysis (vitamin D level, total hip DEXA T value, and femoral neck DEXA T value) and the fourth: age. Conclusion: OxSport clinical practice could be improved by more comprehensively evaluating bone stress risk factors. The importance of this evaluation is demonstrated by the population found positive for these risk factors. Using this cohort, potential bone stress risk factors that significantly impacted return-to-activity prognosis were predicted using regression models.

Keywords : eating disorder, bone stress risk factor, femoral neck stress fracture, vitamin D
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