

Abstract Title : Musculoskeletal ultrasound evaluation of joint health status and bleeding phenotype in severe and non-severe hemophilia (A and B)

Category: 300s - Hemostasis, Thrombosis and Vascular Wall Biology

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Abstract Body

Introduction: People with hemophilia (PwH) A and B are known to have variable bleeding phenotypes, may have joint bleeding that is less clinically apparent, and musculoskeletal ultrasound (MSKUS) has become an established modality for evaluating joint status. Evaluation of individual bleeding phenotype can be challenging, however clinical tools including the International Society on Thrombosis and Haemostasis Bleeding Assessment Tool (ISTH-BAT), self-BAT, and the Beighton Hypermobility Score (BHS) are useful, validated tools for evaluation of joint health status, in addition to MSKUS.

We hypothesize that presence and degree of joint disease, evaluated with MSKUS and physical assessment scoring, will correlate with severity of bleeding phenotype as characterized through clinical history, BAT assessment, and presence of joint hypermobility in PwH A and B.

Methods: We assessed baseline joint status of elbows, knees, and ankles, and disease progression over one year with MSKUS, ISTH-BAT, self-BAT, and assessment of hypermobility with the BHS. PwH with severe, moderate, or mild hemophilia A or B were assessed at baseline and one year later during their comprehensive clinic visit at our institution. Clinical bleeding phenotype was evaluated with BHS and BAT scores, and joint health was evaluated with MSKUS. Joint health outcomes were reviewed comparing baseline to year 1 metrics. Analysis of joints with arthropathy included determination for improvement, maintenance and worsening of joint health in terms of hemophilia severity and ABR.

Results: 101 PwH were enrolled. Of the 101 total enrolled, the majority were PwH A (n=75) severe (43), moderate (7), mild (25). The remaining patients (n=26) were PwH B severe (7), moderate (13), mild (6). Many patients were regularly treated with prophylaxis at baseline (55/100), with 10 having a history of inhibitors, 9 PwH A and 1 PwH B. 28 patients enrolled with target joints mild (2); moderate (1); severe (25). MSKUS measurements were completed using the JADE protocol¹. Baseline clinical bleeding data showed ISTH-BAT mean 13 (SD 13) and median 7 (IQR 7.6 – 18), self-BAT mean 13 (SD 13) and median 8 (IQR 6-18.5), BHS mean 2 (SD 1) and median 1.9 (IQR 0-2), annualized bleed rate (ABR) mean 2.7 (SD 1) and median 4.5 (IQR 0-3.3). Seventy-five PwH completed follow-up MSKUS. Joints with arthropathy showed improvement in 13 elbow (PwH A: mild 4, moderate 1, severe 4), stable elbow in 5 (PwH A: mild 1, moderate 2, severe 1), worsened elbow in 17 (PwH A: mild 4, moderate 1, severe 6; PwH B: mild 1, moderate 1); improved ankle in 30 (PwH A: mild 3, moderate 2, severe 12; PwH B: mild 2, moderate 1), stable ankle in 24 (PwH A: mild 3, severe 10; PwH B: mild 1, moderate 1), worsened ankle in 27 (PwH A: mild 6, moderate 1, severe 8; PwH B: mild 2, moderate 3); improved knee in 25 (PwH A: mild 5, moderate 1, severe 8; PwH B: mild 1, moderate 1), stable knee in 17 (PwH A: mild 2, severe 6; PwH B: mild 3, moderate 4), worsened knee in 40 (PwH A: mild 8, moderate 1, severe 13; PwH B: mild 3, moderate 3). PwH and ABR of 0 showed (improvement in elbow 1, stable 2, worsened 5), (improvement in ankle 9, stable 7 worsened 9), (improvement in knee 0, stable 10, worsened 15); ABR 1-3 showed (improvement in elbow 6, stable 2, worsened 4), (improvement in ankle 9, stable 6, worsened 8), (improvement knee in 6, stable 5, worsened 11). Surprisingly, 12 PwH with reported historical zero ABR demonstrated worse joint health status with follow-up MSKUS (10 worse elbow, 7 knee, 5 ankle).

Discussion: Knowledge pertaining to joint health status and bleeding phenotype in PwH A and B is limited. We assessed the presence and degree of joint disease, evaluated with MSKUS and physical assessment scoring, and severity of bleeding phenotype as characterized through clinical history, BAT assessment, and presence of joint hypermobility in PwH hemophilia A and B. Some PwH demonstrated worsening joint status despite historical zero ABR, which suggests MSKUS utility in evaluation of the effect of sub-clinical bleeding. These results suggest a needed large, multicenter study to expand understanding of joint status and bleeding phenotype in PwH.

References 1. Volland, L.M., et al., Development and Reliability of the Joint Tissue Activity and Damage Examination for Quantitation of Structural Abnormalities by Musculoskeletal Ultrasound in Hemophilic Joints. *J Ultrasound Med*, 2019. 38(6): p. 1569-1581.

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