Surface electromyography evaluation in patients with hemophilia undergoing swimming classes

Glenda Feldberg, Márcia A.P. Matta, Janaína B.S. Ricciardi, Samuel S. Medina, Margareth C. Ozelo
IHTC "Cláudio L. P. Corrêa" - INCT do Sangue Hemocentro Unicamp, Campinas, SP Brazil

Topic:
MSK – Physiotherapy and Rehabilitation

INTRODUCTION

Recurrent musculoskeletal bleeds in patients with hemophilia (PWH) lead to deformities and limitations in functional activities. It has been shown that swimming is a safe and effective sport activity for these patients. However, it is difficult to objectively assess the benefits of this activity. The objective of this study was to evaluate the thigh muscles strength and function using surface electromyography (EMG) before and after swimming program in PWH.

METHODS

Severe hemophilia A (sHA) and B (sHB) patients were evaluated using the surface EMG measurements of the thigh muscles. The evaluation was performed with the maximal voluntary contraction (MVC) test (figure 1.A), and strength test using dynamometer with the peak value of the repetitions (figure 1.B), according to the recommendations by SENIAM (Surface ElectroMyoGraphy for the Non-Invasive Assessment of Muscles). After the initial assessment, patients underwent swimming classes for beginners, consisting of 45-minute classes twice a week for 12 weeks (figure 2). EMG responses expressed in microvolt (μV) were subjected to statistical analysis with the nonparametric Wilcoxon test.

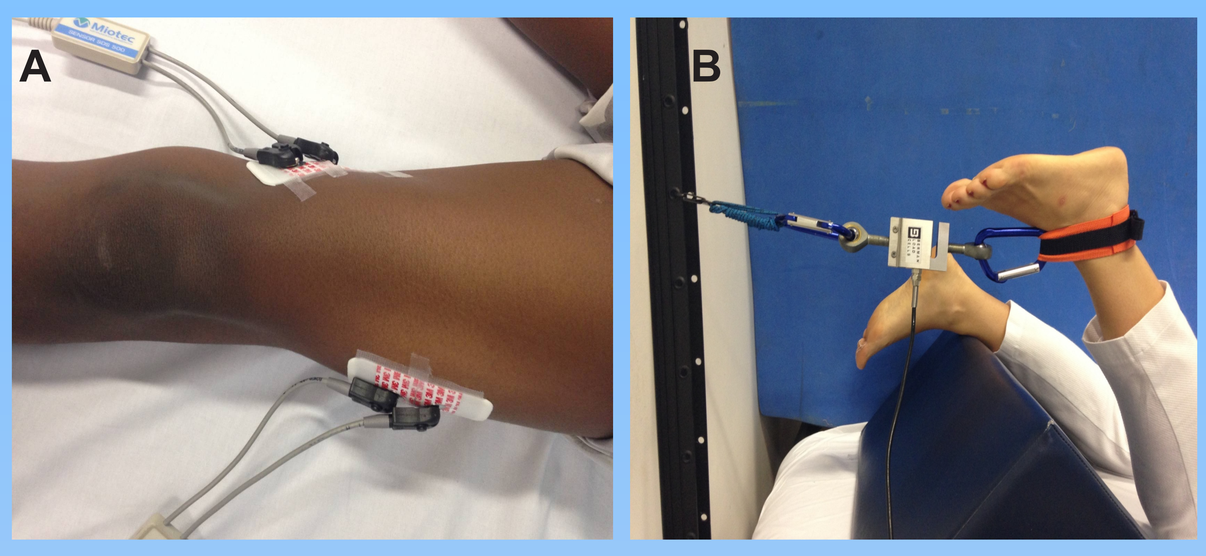

Figure 1. EMG measurements of upper leg muscles. A) Maximal voluntary contraction (MVC) test of left vastus medialis and vastus lateralis. B) Strength test using load cell.

RESULTS

Thirty PWH (22 sHA e 8 sHB), aged 6 to 38 years-old (13±8.7y), without previous regular physical activities, were enrolled in this evaluation. 28/30 patients started secondary prophylaxis for different reasons, during the year before they started the swimming classes. Comparing the results between pre and post-swimming program, it was observed an increase in muscle strength of 25.26% in R knee extensor ($p<0.005$), and 15.74% of L knee extensor ($p<0.02$). Muscle strength of knee flexors showed an increase of 23.29% ($p=0.005$) in R side, and 14.62% ($p<0.002$) in L side as depicted in Figure 3. The analysis of each muscle function, based on the increase in electric activity by EMG, demonstrated a statistically significant difference between pre and post evaluation for all thigh muscles in the L side (vastus lateralis, $p<0.004$; vastus medialis, $p<0.02$; and biceps femoralis, $p<0.02$) (Figure 4) and for vastus lateralis and vastus medialis in the R side ($p<0.05$ and $p<0.02$, respectively).

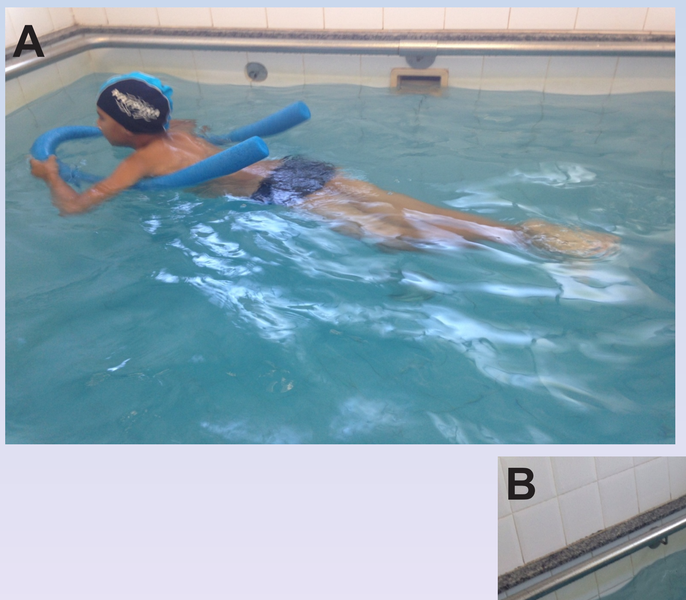

Figure 2. Workout of the leg craw swimming (A), crawl swimming with an elastic resistance (B)

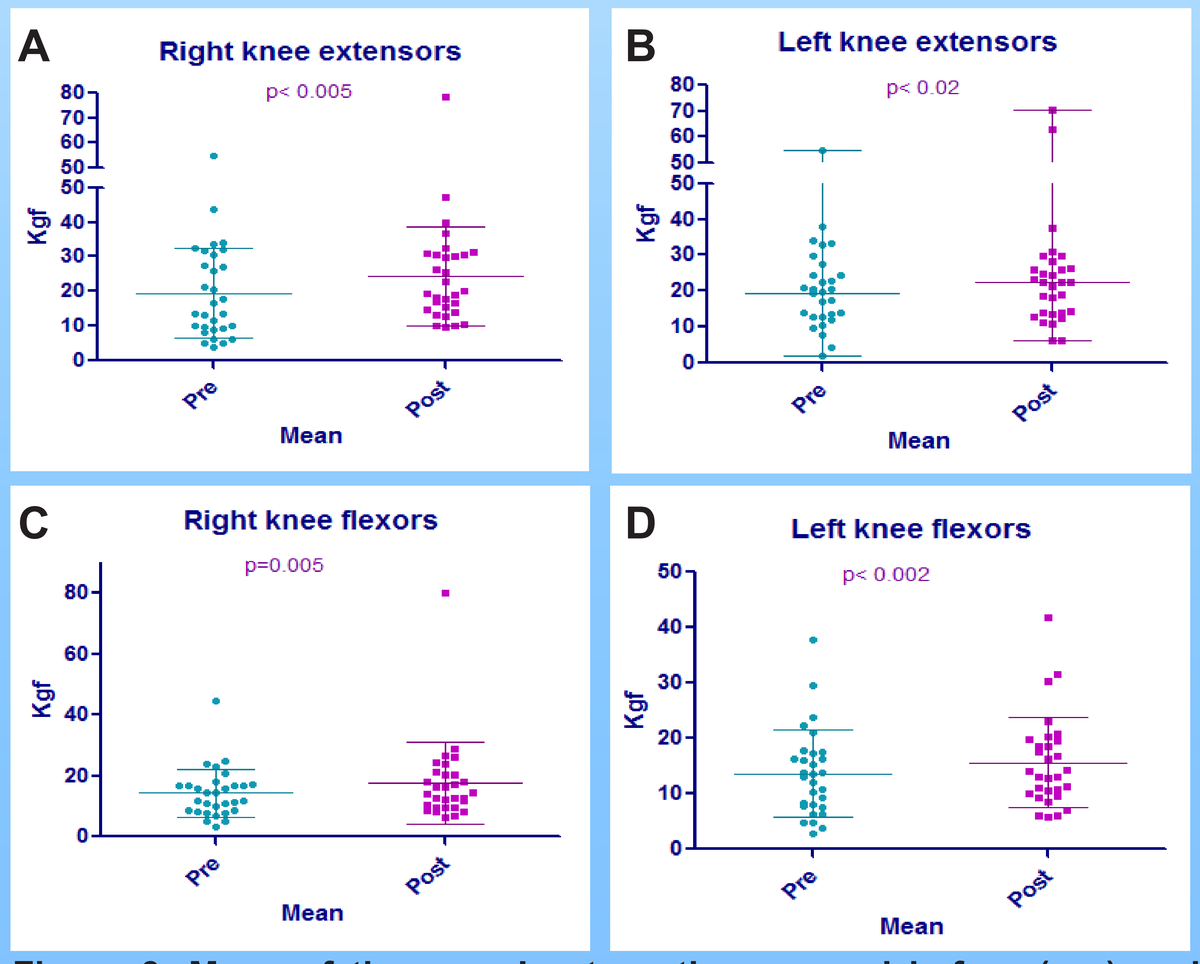

Figure 3. Mean of the muscle strength assessed before (pre) and after (post) swimming classes, in right knee extensors (A), left knee extensors (B), right knee flexors (C), and left knee flexors(D). N = 30.

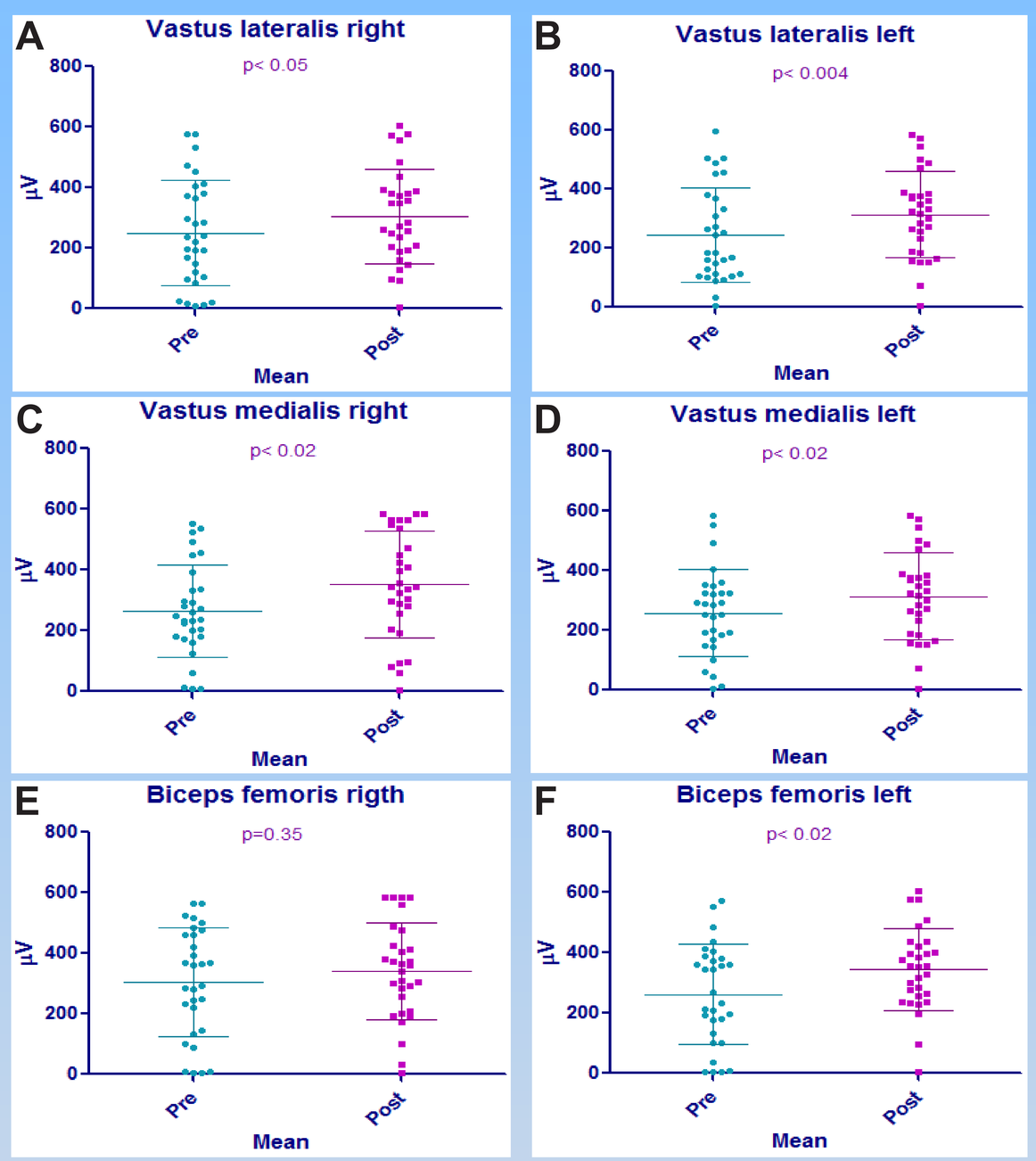

Figure 4. Mean of the electric activity assessed by EMG before (pre) and after (post) swimming classes, in vastus lateralis right (A), vastus lateralis left (B), vastus medialis right (C), vastus medialis left (D), bíceps femoralis right (E), bíceps femoralis left (F). N = 30.

CONCLUSION

The EMG results showed an increase in the strength and function of thigh muscles in PWH after a swimming program. The surface EMG demonstrated to be a safe and effective method for muscle evaluation in patients with hemophilia. The results showed that swimming is effective with considered benefits in a short period of time.

REFERENCES

1. Kurz et al , SEMG activation patterns of thigh muscles during upright standing in haemophilic patients, Haemophilia, 2011, 17(4), p. 669–75.
2. SENIAM Project . Surface ElectroMyoGraphy for the Non-Invasive Assessment of Muscles. Available in: http://www.seniam.org/. Visited in January 2nd.
3. Hermens HJ, Freriks B, Disselhorst-Klug C, Rau G. Development of recommendations for SEMG sensors and sensor placement procedures. J Electromyogr Kinesiol. 2000;10(5):361-74.

emailing address : glenda.fisio@uol.com.br;

DOI: 10.3252/pso.eu.WFH2014.2014