

Predictive value of blood oxygen saturation variability in intradialytic hypotension

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BACKGROUND

Hypotension is a frequent complication of hemodialysis sessions which generate a high morbidity and mortality for patients. More and more tools are developed in dialysis to monitoring hemodynamic parameters such as blood volume, hematocrit or blood oxygen saturation (SO₂) to prevent intradialytic hypotension. Indeed, same as critical care unit, SO₂ can help the clinician to provide information of hemodynamic status and cardiac output of hemodialysis patients.

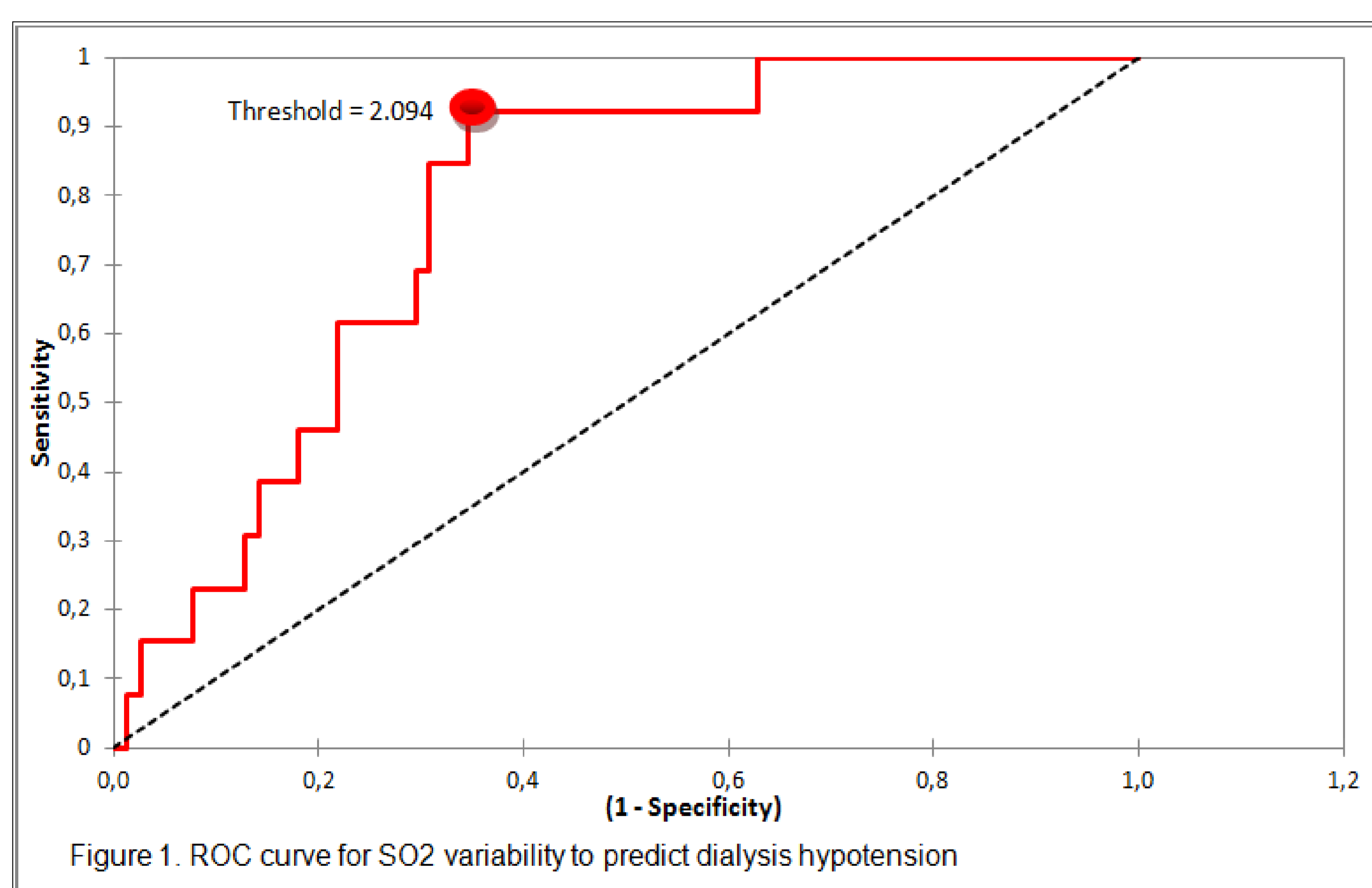
The aim of the study is to evaluate if the value of SO₂ variability can predict hypotension during HD sessions.

METHODS

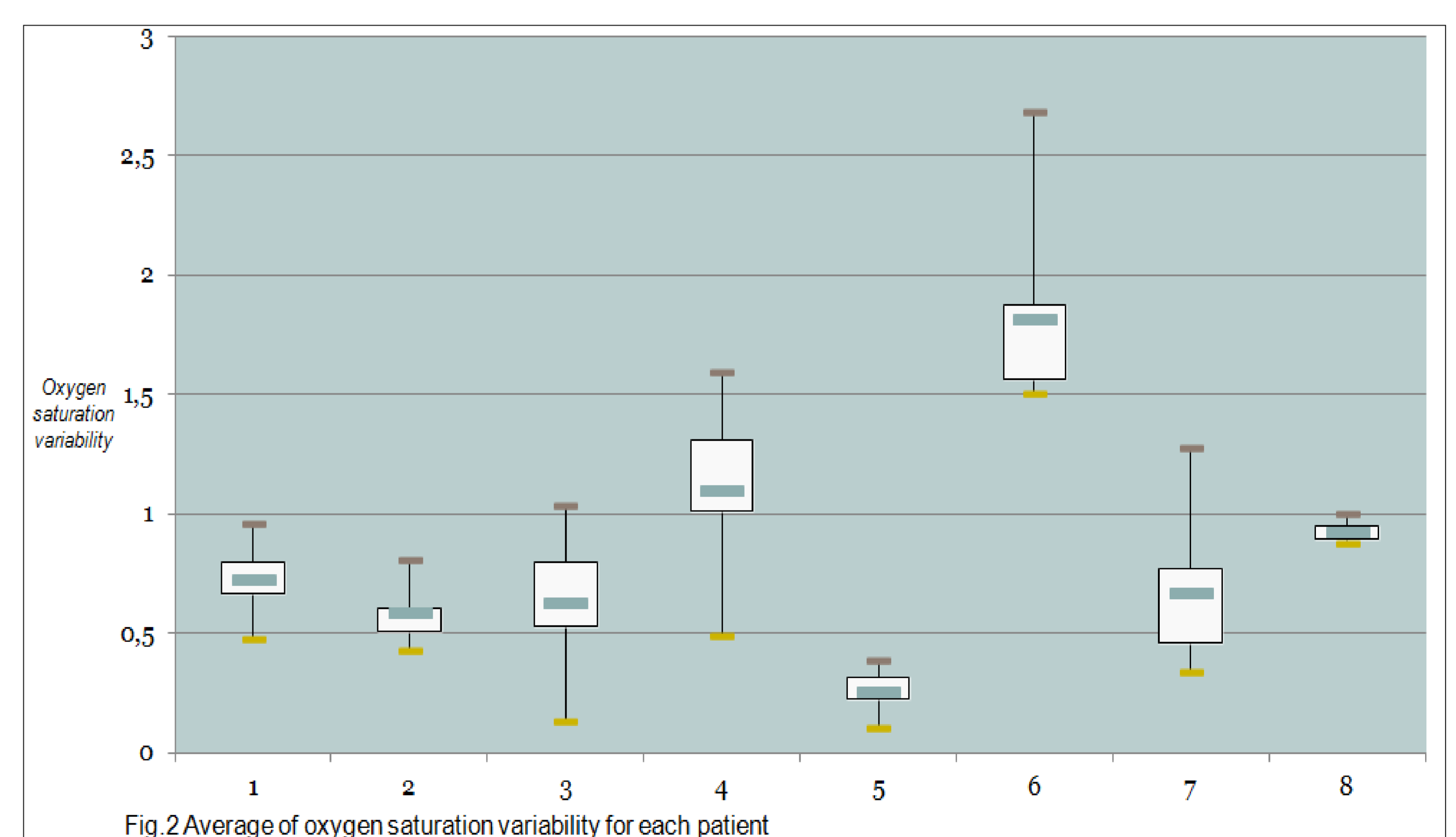
8 patients with an arteriovenous fistula, prone to IDH, in the HD unit of Duchenne hospital in Boulogne sur mer (France) were enrolled in an observational study (March 2015). Dialysis monitors were equipped with an optical sensor on the arterial line allow to monitoring oxygen saturation throughout the session (Flexya, BELLCO). The signal was acquired with a frequency of 1 sample per 5 seconds and the variability can be calculated with the standard deviation over a 5 minutes long window. Blood pressure, pulse rate, ultra filtration, every symptomatic hypotension and their time to onset were collected.

RESULTS

Among the 91 hemodialysis sessions of the study, an IDH occurred in 13,4% of case. The blood flow was 350 +/- 21 mL/minutes, the session duration was 260 +/- 27 minutes and the ultrafiltration rate was 2,72 +/- 0,78 liters. The analyse show that the mean SO₂ was comparative between hypotension group sessions and no hypotension group (95,6 % versus 96,1 % ; p = 0,318). However, SO₂ fall was more important in sessions with intradialytic hypotension (85,7% versus 90,3% ; p = 0,001) such as the maximal peak of SO₂ variability equal to 3,14 +/- 1,09 (1,37 – 4,96) against 2,05 +/- 1,18 (0,58 – 5,58) (p = 0,001).



AUC curve defined a threshold of SO₂ variability equal to 2.094 to have the most predictive performances of IDH (AUC 0,778). The sensitivity was 92,3%, the specificity was 65,4%, and the predictive positive value was 98,1%. The occurrence time of intradialytic hypotension after exceed the threshold was 57 +/- 28 minutes.



Analyse show a better specificity of the system with a specific threshold for each patient that can reach 93,8%. Two patients who have chronic hypotension with low blood pressure before hemodialysis session seems to have the highest saturation variability. In this case, the discrimination power of saturation variability for hypotension would be less.

CONCLUSION

Variability of SO₂ during hemodialysis sessions seems to be a good tool to predict hypotension according to the results of Mancini and al (1). The best and new education of this study is that the system must to be individualized for each patient with a specific threshold of SO₂ variability. In the future, we can imagine taking advantage of the time between exceeding the threshold and hypotension to implement manoeuvres to ovoid the occurrence of intradialytic hypotension. After this pilot study, we need to evaluate this tool in a large prospective study.