

Ultrasound Pulse Elastometry: Assessment of One Year's Practice in the Hepato-Gastroenterology Department of the Saint Camille Hospital in Ouagadougou

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How to cite this paper: Somda, K.S., Ky, L.J.E., Johnson, C.L.C., Paré, S.L.E., Djibo, B.M.A., Vébamba, T., Ouédraogo, A., Ousseini, F., Diallo, M.S., Héma/Soudré, S.M.O.B., Coulibaly, A. and Sombié, A.R. (2024) Ultrasound Pulse Elastometry: Assessment of One Year's Practice in the Hepato-Gastroenterology Department of the Saint Camille Hospital in Ouagadougou. *Open Journal of Gastroenterology*, 14, 379-385.
<https://doi.org/10.4236/ojgas.2024.1411039>

Received: October 31, 2024

Accepted: November 18, 2024

Published: November 21, 2024

Abstract

Aims: To review one year of ultrasound impulse elastometry in a hospital in Ouagadougou. **Patients and Method:** This is a retrospective descriptive study of data from one year's use of impulse ultrasound elastometry. Ultrasound impulse elastometry was performed using the FibroScan® COMPACT 530. Fibrosis was considered significant when E (hepatic elasticity) ≥ 7.2 kPa (F2 fibrosis). The test was considered valid when the IQR/Median ratio $\leq 30\%$ and there were at least 10 valid measurements. **Results:** A total of 1911 patients underwent FibroScan®. There were 1079 men, giving a sex ratio of 1.3. The mean age of the patients was 37.9 ± 12.2 years. The indication for FibroScan® was hepatitis B virus infection in 89% of cases. The validation criteria for FibroScan® were met in all patients. The mean value for elasticity was 7.9 kPa and for steatosis 212 dB/m. Fibrosis was non-significant in 75.5% of cases. More than half of our patients (56.7%) didn't have steatosis, 24.8% had mild steatosis, 12.4% had moderate steatosis and 6.1% had severe steatosis. **Conclusion:** Ultrasound pulse elastometry plays an important role in monitoring chronic liver disease. It allows non-invasive diagnosis of hepatic fibrosis and

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steatosis. In our context, however, access to the test is limited by its availability only in large urban centers, and by its cost.

Keywords

Pulse Elastometry, Hepatic Fibrosis, Steatosis, Non-Invasive Evaluation of Fibrosis, Africa

1. Introduction

Ultrasound pulse elastometry is a non-invasive, painless, rapid and objective method of quantifying liver fibrosis by measuring liver stiffness [1]. It plays an important role in assessing hepatic fibrosis in patients with chronic liver disease. Indeed, all chronic liver diseases, whatever their cause, can lead to the development of cirrhosis if they are prolonged [2]. Assessment of hepatic fibrosis is therefore an important part of monitoring these patients, and has a bearing on certain therapeutic decisions.

Hepatitis B virus (HBV) infection is a global public health problem. It is the main cause of cirrhosis and hepatocellular carcinoma [3]. The clinical expression and natural history of this infection are variable, ranging from inactive carriage to true chronic progressive hepatitis, which may progress to cirrhosis and hepatocellular carcinoma [4]. Liver biopsy is the gold standard for investigating liver pathologies. However, this examination has its drawbacks. It is an invasive examination, with a high morbidity and mortality rate. It is a diagnostic procedure that is not always well accepted by patients, making it difficult to apply systematically to the follow-up of liver disease. Its reliability is subject to possible sampling errors, a degree of inter-observer variability and the size of the sample [5].

Over the past 20 years, FibroScan® has established itself worldwide as the benchmark for non-invasive liver diagnostics [6]. It works using the one-dimensional elastometry or pulse elastography technique. Ultrasound (3.5 MHz) is used to follow the propagation of a low-frequency elastic shear wave (50 Hz), the speed of which depends on the hardness of the liver. The measurement is taken using a probe placed on the surface of the patient's skin opposite the right lobe of the liver. The result is obtained at the end of the examination, which lasts around five minutes [7]. To our knowledge, few studies on ultrasound pulse elastometry have been conducted in Burkina Faso. The aim of our work was to review one year's experience of ultrasound pulse elastometry in a hospital in Ouagadougou.

2. Patients and Methods

This is a retrospective descriptive study based on data from one year of FibroScan® use. It covered the period from 24 May 2022 to 23 May 2023.

All patients who underwent FibroScan® in the hepato-gastroenterology department of the Saint Camille Hospital of Ouagadougou (HOSCO) during the study

period were included.

Patients whose results were incomplete or for whom the validity criteria of the examination were not met (IQR/Median > 30% or number of valid measurements < 10) were not included. Data were collected from the digital results (PDF files) of the FibroScan® 530 COMPACT.

The variables in our study were age, sex, place of residence, indication for the examination, liver stiffness value, fibrosis stage (METAVIR score), Controlled Attenuation Parameter (CAP), liver steatosis stage.

The FibroScan® examination was performed in patients who were fasting for at least 3 hours prior to the examination. The patients were positioned supine, bare-chested. Their left arm was at their side, the right leg crossed over the left, the right hand folded under the head and the right arm fully abducted to clear the intercostal spaces. The probe was placed perpendicular to the skin between the 9th and 11th right intercostal spaces on the mid-clavicular line, and measurements were acquired. Measurements were acquired with the M probe for patients with a BMI < 30 kg/m² and with the XL probe for patients with a BMI ≥ 30 kg/m².

- The validity criteria for FibroScan® results were:
 - at least 10 valid measurements;
 - IQR/Median ratio ≤ 30%.
 - ✓ IQR/Median < 10%: Excellent
 - ✓ IQR/Median 10 - 20%: Very good
 - ✓ IQR/Median 20 - 30%: Good
- The measure of fibrosis was classified as follows
 - F0-F1 (minimal or non-significant fibrosis) when liver stiffness ≤ 7.1 kPa
 - ≥ F2 or significant fibrosis if elasticity ≥ 7.2 Kpa and < 9.4 Kpa
 - ≥ F3 or severe fibrosis if elasticity ≥ 9.4 Kpa and < 12.2 Kpa
 - F4 or cirrhosis if elasticity ≥ 12.2 Kpa
- Steatosis was assessed using the following standards:
 - S0 or no steatosis if CAP < 225 dB/m
 - S1 or mild steatosis if CAP between 225 and 239 dB/m
 - S2 or moderate steatosis if CAP between 240 and 280 dB/m
 - S3 or severe steatosis if CAP > 280 dB/m

3. Results

During our study period, 1911 FibroScan® were performed in the hepato-gastroenterology department of the Saint Camille Hospital of Ouagadougou (HOSCO). There were 1079 men (56.4%), giving a sex ratio of 1.2.

The mean age was 37.9 ± 12.2 years, with extremes of 1 and 91 years. The 21-40 age group represented 62.6% of the population (**Figure 1**).

More than two thirds of our patients (66.7%) lived in urban areas.

The indication for FibroScan® was hepatitis B virus infection in 89% of cases (**Table 1**).

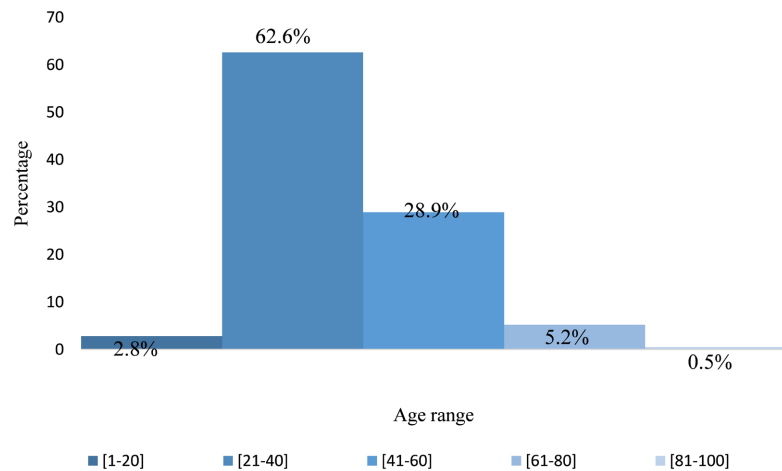


Figure 1. Distribution of patients by age group.

Table 1. Distribution of patients by FibroScan® indication.

FibroScan® indication	Number	Percentage
Hepatitis B virus infection	1700	89
Hepatitis C virus infection	64	3.3
Hepatic steatosis on ultrasound	60	3.1
Hepatitis B contact marker	24	1.3
Other*	63	3.3
Total	1911	100

*HBV-HCV co-infection, HCV-HCV contact, ascites, heterogeneous liver, alcohol user, cirrhosis, dysmorphic liver, autoimmune hepatitis, hepatic cyst, hepatomegaly.

Mean liver stiffness was 7.9 ± 10.1 kPa with extremes of 2.1 and 75 kPa.

Three-quarters of patients (75.5%) had fibrosis classified as F0 - F1, 141 patients (7.2%) had fibrosis F1 - F2, 139 patients (7.3%) had fibrosis F2 - F3 and 189 patients (10%) had fibrosis F3 - F4.

Half of our patients (49.9%) had an IQR/median ratio < 10%, 799 patients (41.8%) had an IQR/median ratio between 10 and 20% and 157 patients (8.3%) had an IQR/median ratio between 20 - 30%.

The mean value of the CAP measurement in the patients was 212 ± 50.1 dB/m with extremes of 100 and 400 dB/m.

More than half of our patients (56.7%) had no steatosis (S0), 474 patients (24.8%) had S1 steatosis, 237 patients (12.4%) had S2 steatosis and 116 patients (6.1%) had S3 steatosis.

4. Discussion

FibroScan®, a non-invasive method of assessing liver fibrosis, has revolutionised the monitoring of patients with chronic liver disease. Assessment of fibrosis is used to depend on liver biopsy. Its use has gradually spread throughout the world,

and Burkina Faso is no exception. Our study has the merit of being one of the first of its kind in our country.

The predominance of men in our study is in line with the data in the African literature. Indeed, Sokpon *et al.* in Morocco and Hatrydt *et al.* in Ivory Cost found a predominance of men, with 61.1% and 71.1% respectively [8] [9]. This male predominance was also reported by Diallo *et al.* in Guinea, with 51% men [10]. According to the latest General Census of Population and Housing in Burkina Faso, women face a lack of employment opportunities and are more affected by unemployment than men [11]. The economic factor could contribute to limiting women's access to FibroScan® in our context. In Burkina Faso, the average cost of FibroScan® is 25,000 - 30,000 FCFA (38 - 46 Euro). The average age was 37.9 ± 12.2 years. In Senegal, a similar result was found by Touré *et al.* in whom the mean age was 37 ± 9 years [12]. Diallo *et al.* in Guinea found a mean age of 40 years [10]. In the United Kingdoms, Eddowes *et al.* reported a mean age of 54 ± 18 years [13]. These results show that our patients are young in Africa. The young age of the population observed in our study could be explained by the fact that HBV infection was the main indication for FibroScan®. This infection occurs at a young age in Africa, most often at birth or during the infantile-juvenile period [14]. Another explanation could be the youth of the African population, in contrast to European countries where the population is ageing. According to the latest General Census of Population and Housing in Burkina Faso, 83.2% of the population was under 40 [11]. Infection with the hepatitis B virus was the main indication for FibroScan®, accounting for 89% of cases. Burkina Faso is located in an area of high hepatitis B virus endemicity. The prevalence of viral hepatitis B in our country is 9.1% [15]. This infection is the leading cause of cirrhosis in our context [16], which justifies assessment of fibrosis as part of the follow-up of patients with chronic hepatitis B virus infection. In our study, 75.5% of patients had non-significant fibrosis, a similar result was found by Hatrydt *et al.* in Ivory Cost, in whom fibrosis was non-significant in 71.1% of cases [9]. These results are lower than those of Sokpon *et al.* in whom fibrosis was non-significant in 90% of cases [8]. Diallo *et al.* in Guinea, on the other hand, reported non-significant fibrosis in 58.8% of cases [10]. More than half of our patients (56.7%) had no hepatic steatosis on FibroScan® (S0). This result is similar to that of Hatrydt *et al.* in Ivory Cost (51.8%) [9]. It is higher than that of Wang *et al.* in China, where steatosis was absent in 36.4% of patients [17]. This difference could be explained by the general characteristics of our populations. According to the World Health Organization (WHO), the prevalence of obesity is higher in China than in Burkina Faso [18]. Hepatic steatosis is related to an accumulation of triglycerides in the hepatocytes and is favoured by obesity.

5. Conclusion

Ultrasound pulse elastometry plays an important role in monitoring chronic liver disease. It allows non-invasive diagnosis of hepatic fibrosis and steatosis. In our

context, however, access to the test is limited by its availability only in major urban areas, and by its cost. The rapid performance of FibroScan® and the existence of well-defined validity criteria make it a tool of choice for monitoring patients with chronic liver disease. In our context, chronic hepatitis B infection is the main indication. Equipping public hospitals with FibroScan® should help to improve patient care and early diagnosis of cirrhosis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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