

Full Length Research Paper

Assessment of gallbladder polyps using point shear-wave elastography: a preliminary observation

Daniel Doykov^{1,2*} and Vladimir Andonov²

¹Clinic of Gastroenterology, University Hospital Kaspela, Plovdiv, Bulgaria.

²Department of Internal Diseases, Medical University of Plovdiv, Bulgaria.

*Corresponding author. E-mail: daniel_doykov@abv.bg

Accepted 14 May, 2019

Gallbladder polyps are rarely found, but their malignant potential is 5%. Current guidelines recommend cholecystectomy if the size of the polyp exceeds 10 mm. Unfortunately, neoplasia can be found in even smaller lesions. This study aims at evaluating the point shear-wave elastography for the assessment of gallbladder polyps, collecting data from this kind of diagnostics, and pointing out the difference in wave propagation between the two types of lesions: benign and malignant. 25 polypoid lesions of the gallbladder were examined with pSWE. Two of them were considered malignant according to the clinical picture and imaging diagnostics, including computed tomography (CT) scan, B-mode ultrasonography and pSWE showing the velocity of a propagating ultrasound wave in meters per second (m/s). Nine patients underwent cholecystectomy, including two cases with malignant polyps. The mean size of the benign gallbladder polyps was 6.5 mm \pm 2.5 mm (range, 5–17 mm). Meanwhile, the mean size of the malignant polyps was 11.5 mm \pm 2.5 mm (range, 9–14 mm), showing that one of them was less than 10 mm. The mean velocity of pSWE was 1.45 m/s \pm 0.24 m/s for benign and 2.87 m/s \pm 0.52 m/s for malignant polyps. All benign polyps showed a lower propagation velocity in comparison with the malignant ones. This study demonstrates that pSWE of gallbladder lesions is feasible and may be useful for the differential diagnosis of this disease.

Key words: Elastography, gallbladder, polyp, pSWE.

INTRODUCTION

Point shear-wave elastography (pSWE) is a dynamic development method that has already been successfully applied in density assessment and diagnosis of focal lesions in the liver, breast, thyroid gland, prostate gland, etc. (Itoh et al., 2006; Tan et al., 2013; Moon et al., 2012). It is not routinely performed and there is no research database for the diagnosis of gallbladder polyposis. Approximately 4% of people have polyps in the gallbladder, but they are randomly diagnosed incidentally by ultrasonography. Most of them are inflammatory neoplasms or cholesterol polyps (Pedersen et al., 2012; Corwin et al., 2011). In rare cases, they may be malignant and the ultrasound image often does not differ from that of the benign ones (Lee et al., 2004). Current guidelines for this disease include surgical removal of the polyp (if its size exceeds 10 mm) and regular ultrasound examinations (if the polyp size is up to 10 mm; Pedersen et al., 2012; Corwin et al., 2011). The accuracy of the

criterion "polyp size" is not absolute and, sometimes, a malignant process can also be found in smaller polyps (Terzi et al., 2000). Therefore, a new image-diagnostic method is necessary to determine cholelithiasis. Malignant tissues tend to be thicker and with less elasticity than benign ones, thus the same principle can also be used in gallbladder polyps (Itoh et al., 2006; Tan et al., 2013; Moon et al., 2012). The aim of the study is to assess the feasibility of this type of elastography in the evaluation of gallbladder polyps.

MATERIALS AND METHODS

Patients

The polyps were found with ultrasound as a lesion from the wall of the gallbladder, without an ultrasound track,

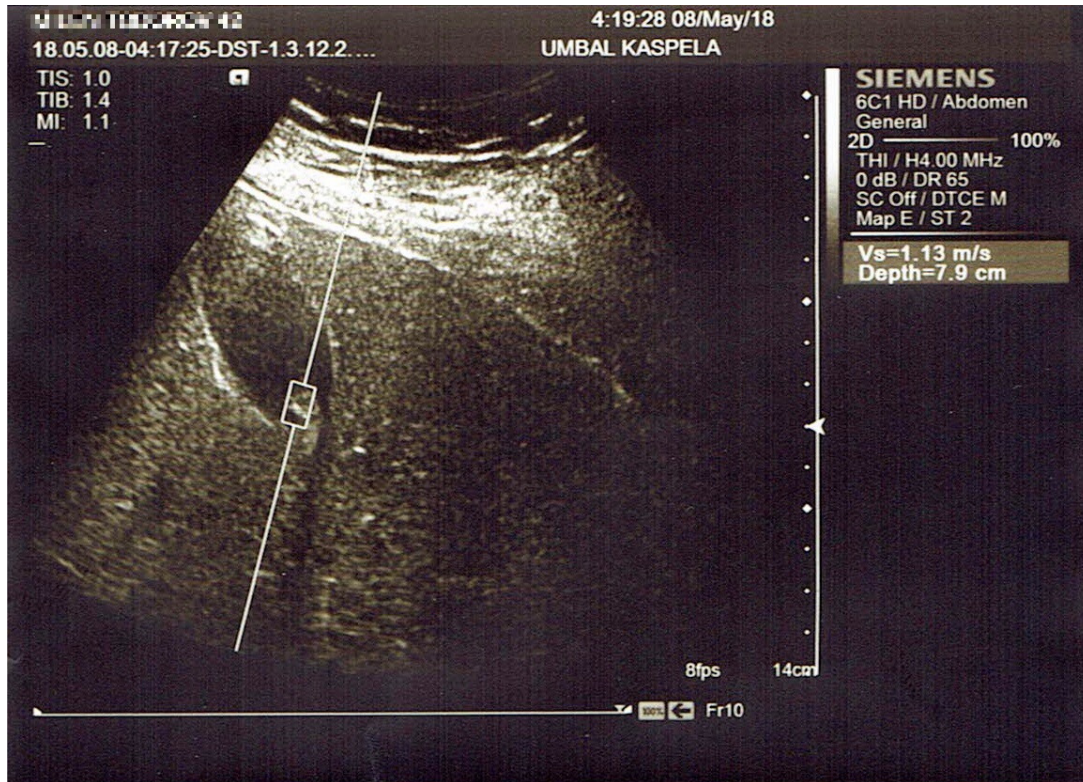


Figure 1. pSWE elastography of a benign polyp in a 42 year old man. The wave velocity is 2.49 m/s and the scan depth is 7.9 cm.

static and hyperechoic compared to bile (Pedersen et al., 2012; Lin et al., 2008). The entire group consisted of 25 patients, of whom 16 were women, 9 were men, with a mean age of 45.1 ± 10.1 years, ranging from 26-72 years. All patients with a polyp size greater than 10 mm were subjected to cholecystectomy - 9 cases. Two cases were histologically proven to be malignant, which coincided with the preliminary expectation.

Devices and scanning

Ultrasound examinations were performed in the left lateral position of the patient, as well as when lying on the back and in fasting condition. The device used was the Siemens Acuson S2000 with a 6C1 HD convex transducer of 1.5 to 6 MHz. Therefore, B-mode ultrasonography and elastography were performed, and five elastographic results were recorded.

Point shear-wave elastography

Gallbladder polyps were measured under fasting conditions by pSWE using a conventional ultrasound system (ElastPQ, iU22, Philips Healthcare) equipped with a convex probe (C5-1). For gallbladder measurements,

patients and controls were examined in the supine position with their right arm abducted to the maximum.

Ethical considerations

This potential observational study was approved by the institutional review board, and the participants gave their informed consent after explaining the purpose and procedure of the study.

Statistical analysis

Statistical analysis was performed with SPSS v.19. An average value with an interval of a mean deviation \pm SD was used. The Kruskal Wallis test was used to compare the elastography and the size of the gallbladder polyps. The statistical significance was $p < 0.05$.

RESULTS

The mean size of the benign polyps is 6.5 ± 2.5 mm (range 5-17). There were no statistically significant differences between the elastostographic score and the size of the polyp (Figure 1). Histologically, the cases with

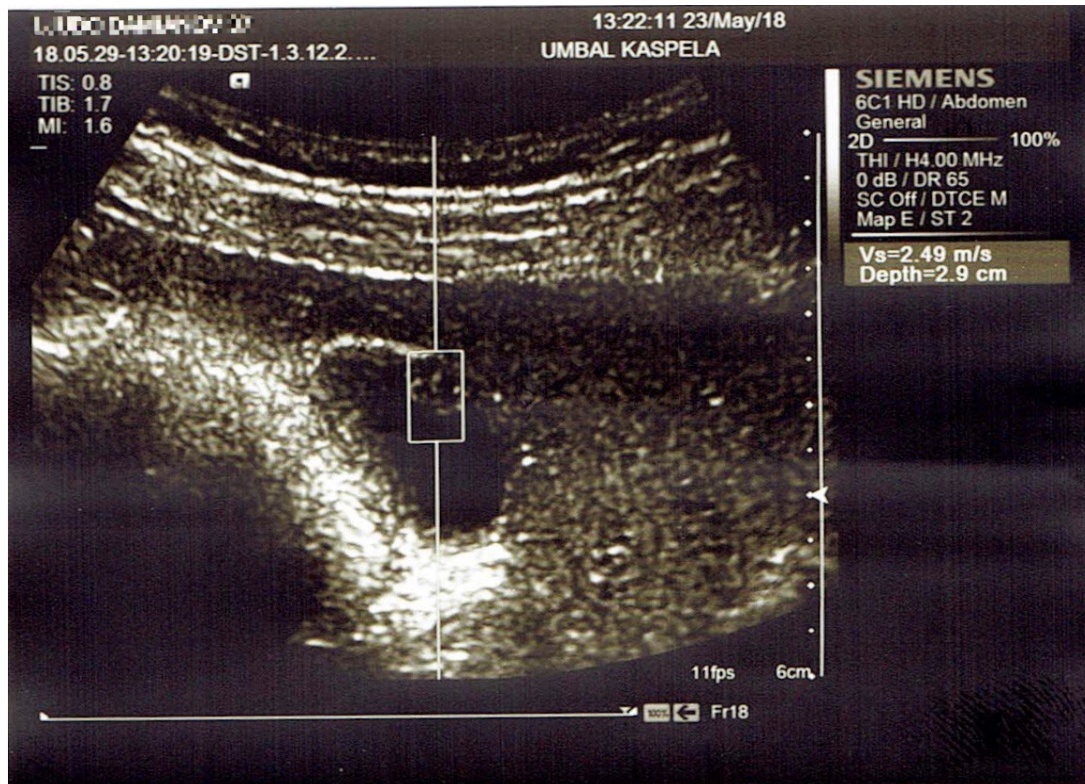


Fig. 2. pSWE elastography of a malignant polyp in 54 year old man. The wave velocity is 2.49 m/s and the scan depth is 2.9 cm.

benign polyps were three (3) hyperplastic and four (4) cholesterol polyps, with a pSWE velocity of $1.45 \text{ m/s} \pm 0.24 \text{ m/s}$. Two patients had malignant cases with a pSWE velocity of $2.87 \text{ m/s} \pm 0.52 \text{ m/s}$ (Figure 2). The mean size of the malignant polyps is $11.5 \text{ mm}, \pm 2.5 \text{ mm}$ (range, 9-14 mm), where one of the polyps is less than 10 mm. The mean pSWE velocity is $2.87 \text{ m/s} \pm 0.52 \text{ m/s}$. All benign polyps showed lower wave velocities compared to the malignant ones. The distance between the transducer and the polyps is $43.3 \text{ mm} \pm 6.4 \text{ mm}$ (range, 28-58 mm).

DISCUSSION

Point shear-wave elastography measures the propagation velocity of the wave in the tissue. Many diseases occur with a change in the density of the affected organ, hence this method has been successfully used in multiple pathologies. So far, no study has been conducted on the possible benefit of this type of elastography in the differential diagnosis of gallbladder polyps. The increasing use of abdominal ultrasound as a basic patient examination method leads to an increase in the random finding of gallbladder polyps. Although most of them are benign, an early malignant transformation is possible without a change in the image. The prognosis for

gallbladder cancer is poor, with less than 10% survival rate for a period of 5 years (Corwin et al., 2011; Hussain et al., 2013). Current guidelines for this disease are based on the polyp size. Regular ultra sound examinations are carried out for polyps less than 10 mm and surgical removal are carried out for polyps size more than 10 mm (Pedersen et al., 2012). As a new diagnostic method, elastography can help in the differential diagnosis. Contrast-enhanced ultrasound (CEUS) shows promising results in the same area, but there are still limitations (Sparchez and Radu, 2012). In this study, we collected data on the interpretation of gallbladder polyps with different sizes and established the difference in the elastography parameters. Some limitations exist mainly with the number of cases with malignant polyps, as well as the factors affecting the result – the artifacts, depth and density of the lesion. More studies need to be performed in order to collect a large database.

Conclusion

In this study, we were able to evaluate point shear-wave elastography in the assessment of gallbladder polyps by collecting this diagnostic data and indicating the differences in the wave propagation between the two

types of lesions: benign and malignant. Our findings confirm that all benign polyps have lower propagation velocities in comparison with the malignant ones. This study shows that pSWE of gallbladder lesions is feasible and can be useful for the differential diagnosis of this disease.

Conflict of interest: The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- Corwin MT, Siewert B, Sheiman RG, Kane RA (2011). Incidentally detected gallbladder polyps: is follow-up necessary? Long-term clinical and US analysis of 346 patients. *Radiology* 258:277-282.
- Hussain HM, Little MD, Wei S (2013). AIRP best cases in radiologic-pathologic correlation: gallbladder carcinoma with direct invasion of the liver. *Radiographics* 33:103-108.
- Itoh A, Ueno E, Tohno E, Kamma H, Takahashi H, Shiina T, Yamakawa M, Matsumura T (2006). Breast disease: clinical application of US elastography for diagnosis. *Radiology* 239:341-350.
- Lee KF, Wong J, Li JC, Lai PB (2004). Polypoid lesions of the gallbladder. *Am. J. Surg.* 188:186-190
- Lin WR, Lin DY, Tai DI, Hsieh SY, Lin CY, Sheen IS, Chiu CT (2008). Prevalence of and risk factors for gallbladder polyps detected by ultrasonography among healthy Chinese: analysis of 34 669 cases. *J. Gastroenterol. Hepatol.* 23:965-969
- Moon HJ, Sung JM, Kim EK, Yoon JH, Youk JH, Kwak J (2012). Diagnostic performance of gray-scale US and elastography in solid thyroid nodules. *Radiology* 262:1002-1013
- Pedersen MR, Dam C, Rafaelsen SR (2012). Ultrasound follow-up for gallbladder polyps less than 6 mm may not be necessary. *Dan Med. J.* 59:A4503.
- Sparchez Z, Radu P (2012). Role of CEUS in the diagnosis of gallbladder disease. *Med. Ultrason.* 14:326-330.
- Tan S, Özcan MF, Tezcan F, Balci S, Karaoğlanoğlu M, Huddam B, Arslan H (2013). Real-time elastography for distinguishing angiomyolipoma from renal cell carcinoma: preliminary observations. *AJR Am. J. Roentgenol.* 200:W369-W375.
- Terzi C, Sökmen S, Seçkin S, Albayrak L, Uğurlu M (2000). Polypoid lesions of the gallbladder: report of 100 cases with special reference to operative indications. *Surgery* 127:622-627.