Biomedical Research 2018; 29 (2): 305-308

ISSN 0970-938X
www.biomedres.info

Clinical value of CT diagnosis in abdominal trauma.

Xiang Li*, Shu-Tong Zhang, Xiang Wang, Jing-Ting Chen

Department of Radiology, Wuhan Central Hospital, Affiliated to Tongji Medical College of Huazhong University of Science and Technology, Wuhan, PR China

Abstract

Objective: This paper discusses the clinical value of CT diagnosis in abdominal trauma.
Method: Eighty patients with abdominal trauma admitted in our hospital from April 2015 to July 2017 were selected and subjected to B-ultrasonography and CT scan. Surgical and pathological diagnoses were used as the gold standard. The two diagnostic methods were compared in terms of sensitivity, specificity, accuracy, and diagnosis accordance rate of organ injury in the abdomen.
Results: Based on surgical and pathological diagnoses, 75 of 80 patients (93.8%) were confirmed to have organ injury in the abdomen and included 25 patients with spleen damage, 13 patients with liver damage, 10 patients with kidney damage, 10 patients with pancreas damage, 9 patients with small intestine/duodenum damage, and 8 patients with peritoneum damage. The sensitivity, specificity, and accuracy of B-ultrasonography are 82.6%, 80.0%, and 82.5%, which are not significantly different from those of CT scan (90.7%, 80.0%, and 90.0%) (P>0.05). The diagnosis accordance rates of B-ultrasonography in the spleen, liver, kidney, pancreas, small intestine/duodenum, and peritoneum damages are 92.0%, 92.3%, 100.0%, 80.0%, 77.8%, and 75.0%, respectively, and those of CT scan are 100.0%, 100.0%, 90.0%, 90.0%, 100.0%, and 87.5%, respectively; the difference between the two methods is not significant (P>0.05).
Conclusions: B-ultrasonography and CT scan present similar clinical results in abdominal trauma diagnosis. These procedures are noninvasive, simple to operate, and worthy of further clinical promotion and application.

Keywords: Abdominal trauma, B-ultrasonography, CT, Clinical value.

Accepted on October 26, 2017

Introduction

Abdominal trauma is a common traumatic injury and has high fatality rate. The incidence rate of abdominal trauma increases due to the frequent occurrence of traffic accidents [1]. The clinical symptoms of abdominal trauma mainly include nausea, emesis, stomach-ache, and hematuresis, which affect the daily life and work activities of patients [2]. Abdominal trauma is relatively complicated and is mainly determined by organ injury in the abdomen. Organ injuries in the abdomen can cause infection, hemorrhage, shock, peritonitis, and even death [3]. Hence, early diagnosis and interventions should be given to patients to protect their lives. In this study, 80 patients with abdominal trauma admitted in our hospital from April 2015 to July 2017 were selected for evaluation of the clinical value of CT diagnosis.

Information and Method

General information

Eighty patients with abdominal trauma admitted in our hospital from April 2015 to July 2017 were selected. The participants included 32 females and 48 males, aged 20 to 76 y (average of 43.4 ± 9.7 y). The main causes of trauma among the patients were traffic accident (n=50), occupational injury (n=15), fall accident from a high place (n=10), and fights (n=5). The shortest time from the injury to the diagnosis is 2 h, and the longest time is 24 h (8.1 ± 2.4 h in average).

Methods

B-ultrasonography: Patients were examined in supine, sitting, prostrate, and lateral positions by using real-time diasonograph under the probe frequency range of 4.0-6.0 MHz. The organs at lesion and surrounding organs were examined carefully in terms of damage and pain. The abdominal cavity was also examined for the presence of seroperitoneum. Inspection of organs, such as the liver, kidney, and pancreas, was performed in different regions of the abdomen, noting for substantial organ damage. Abnormal representations in the ultrasonogram were used as the basis for diagnosis; these representations included abnormal organ shape parenchymatous anomaly, disturbed echo area, and enhanced echo. Hematoma was diagnosed by the existence of hypoecho or opaque dark area in

fluid, and visceral laceration was diagnosed by interrupted capsular echo, strip echo, or sporadic echo in cracks.

CT diagnosis: A 64-layer spiral CT machine was used and operated under the following parameters: 130-150 mAs current, 120 kV voltage, 50 cm view, 512 × 512 matrix, 2.5 mm layer thickness, 6-7 mm reestablished layer thickness, 1.25 screw pitch, and 150-250 HU window width. Scanning was performed from the hepatic dome to the symphysis pubis and lower right kidney. In clinics, the pelvic cavity can be scanned according to practical situations of patients. Retroperitoneum and intestinal injuries were examined carefully. Capsular hematoma was diagnosed by a stripped or crescent-shaped capsular membrane. Hematoma caused by organ damage was diagnosed by cracking or flake-like and stripped low-density shadow in organs.

Observation index

The two diagnostic methods were compared in terms of sensitivity, specificity, accuracy, and diagnosis accordance rate of organ (spleen, liver, kidney, pancreas, small intestine/duodenum, and peritoneum) injury in the abdomen.

Statistical analysis

Data of the two diagnostic methods were analysed by SPSS22.0. Results were expressed in percentage and verified by χ^2-test. Differences at $P<0.05$ are not significant.

Results

Surgical and pathological diagnostic results

Seventy-five of the 80 patients recruited presented organ injury in the abdomen (93.8%) and included 25 patients with spleen damage, 13 patients with liver damage, 10 patients with kidney damage, 10 patients with pancreas damage, 9 patients with small intestine/duodenum damage, and 8 patients with peritoneum damage.

B-ultrasonography results

The sensitivity, specificity, and accuracy of B-ultrasonography are 82.6% (62/75), 80.0% (4/5), and 82.5% (66/80), respectively (Table 1).

Table 1. *B-ultrasonography results.*

Surgical and pathological diagnosis	B-ultrasonography		Total
	Organ injury in the abdomen	No organ injury in the abdomen	
Organ injury in the abdomen	62	13	75
No organ injury in the abdomen	1	4	5
Total	63	17	80

CT diagnostic results

The sensitivity, specificity, and accuracy of CT scan are 90.7% (68/75), 80.0% (4/5), and 90.0% (72/80), respectively (Table 2).

Table 2. *CT diagnostic results.*

Surgical and pathological diagnosis	CT diagnosis		Total
	Organ injury in the abdomen	No organ injury in the abdomen	
Organ injury in the abdomen	68	7	75
No organ injury in the abdomen	1	4	5
Total	69	11	80

Comparison between B-ultrasonography and CT diagnostic results

The sensitivity, specificity, and accuracy of B-ultrasonography are 82.6%, 80.0%, and 82.5%, which are similar to those of CT scan (90.7%, 80.0%, and 90.0%, respectively; $P>0.05$; Table 3).

Table 3. *Comparison between B-ultrasonography and CT scan (n (%)).*

Diagnostic method	Sensitivity (n=75)	Specificity (n=5)	Accuracy (n=80)
B-ultrasonography	62 (82.6)	4 (80.0)	66 (82.5)
CT	68 (90.7)	4 (80.0)	72 (90.0)
χ^2	2.0769	0.0000	1.8972
P	0.1495	1.0000	0.1683

Diagnosis accordance rates of B-ultrasonography in organ injury in the abdomen

The diagnosis accordance rates of B-ultrasonography in the injuries in the spleen, liver, kidney, pancreas, small intestine/duodenum, and peritoneum are 92.0%, 92.3%, 100.0%, 80.0%, 77.8%, and 75.0%, respectively (Table 4).

Table 4. *Diagnosis accordance rates of B-ultrasonography in organ injury in the abdomen.*

Organ injury in the abdomen	Surgical and pathological diagnosis	B-ultrasonography	Diagnosis accordance rate (%)
Spleen injury	25	23	92.0

Liver injury	13	12	92.3
Kidney injury	10	10	100.0
Pancreas injury	10	8	80.0
Small intestine/duodenum injury	9	7	77.8
Peritoneum injury	8	6	75.0

Diagnosis accordance rates of CT scan in organ injury in the abdomen

The diagnosis accordance rates of CT scan in the injuries to the spleen, liver, kidney, pancreas, small intestine/duodenum, and peritoneum are 100.0%, 100.0%, 90.0%, 90.0%, 100.0%, and 87.5%, respectively (Table 5).

Table 5. Diagnosis accordance rate of CT scan in organ injury in the abdomen.

Organ injury in the abdomen	Surgical and pathological diagnosis	CT scan	Diagnosis accordance rate
Spleen injury	25	25	100.0
Liver injury	13	13	100.0
Kidney injury	10	9	90.0
Pancreas injury	10	9	90.0
Small intestine/ duodenum injury	9	9	100.0
Peritoneum injury	8	7	87.5

Comparison between B-ultrasonography and CT scan in organ injury in the abdomen

The diagnosis accordance rate of B-ultrasonography in the injuries to the spleen, liver, kidney, pancreas, small intestine/ duodenum, and peritoneum are 92.0% (23/25), 92.3% (12/13), 100.0% (10/10), 80.0% (8/10), 77.8% (7/9), and 75.0% (6/8), whereas those of CT scan are 100.0% (25/25), 100.0% (13/13), 90.0% (9/10), 90.0% (9/10), 100.0% (9/9), and 87.5% (7/8); the differences are not significant (χ^2=2.0833, 1.0400, 1.0526, 0.3921, 2.2500, 0.4102. P=0.1489, 0.3078, 0.3049, 0.5311, 0.1336, 0.5218>0.05).

Discussion

Abdominal trauma is a common clinical traumatic injury and mainly includes open wounds and closed injuries. The diagnosis and treatment of abdominal trauma should emphasize on organ injury in the abdomen. Traumas on other parts of the body manifest slight clinical symptoms and physical signs and are non-life threatening [4]. By contrast, abdominal trauma is serious and often accompanied with nausea, emesis, stomachache, and hematuresis. The injury progresses gradually and may even lead to death. In clinics, appropriate treatment can save the life of patients successfully. Appropriate nursing care can effectively improve the prognosis of patients [5]. Timely and accurate diagnosis should be performed before any intervention is administered. Only with accurate diagnosis that patients be given appropriate intervention and nursing care, thereby ensuring the safety of patients and improving their prognosis.

B-ultrasonography and CT scan are widely used in clinical diagnosis. These procedures are simple, convenient, noninvasive, and accurate. In abdominal trauma diagnosis, imaging manifestations of organ injury in the abdomen mainly include the following [6,7]. (1) Spleen injury: B-ultrasonography shows interrupted spleen membrane, heterogeneous echo in the parenchyma and adjacent organs, and spleen effusion; CT scan shows uneven parenchyma density and hematocele surrounding the spleen. (2) Liver injury: B-ultrasonography shows nonuniform intrahepatic echo, irregular shape of the liver parenchyma, low echo zone with ambiguous boundaries, and surrounding effusion; CT scan shows nonuniform liver density and surrounding hematocele. (3) Kidney injury: B-ultrasonography presents low echo zone and hematoma surrounding the kidney; CT scan presents nonuniform kidney density and surrounding hematocele. (4) Pancreas: B-ultrasonography shows nonuniform pancreas echo and surrounding effusion; CT scan shows nonuniform pancreas density and surrounding hematocele.

B-ultrasonography can be used to detect organ injuries and hematocele in the abdomen. This technique is simple to operate, low cost, and convenient to perform at bedside and thus has very high clinical application value [8]. The sensitivity, specificity, and accuracy of B-ultrasonography in abdominal trauma are very high; hence, this procedure can be applied and promoted in clinics. However, B-ultrasonography is sensitive to gases in the gastrointestinal tract, and this property influences the diagnosis accuracy [9]. CT scan exhibits high resolution and is insensitive to gases in the gastrointestinal tract. This method can detect organ injuries in the abdomen according to the density shadow in scanned positions. However, CT scan presents limitations in practical applications because of its high cost and inapplicability to patients with unstable hemodynamics [10]. Consistent with related literature, the present results demonstrate that in abdominal trauma diagnosis, B-ultrasonography and CT scan have no significant difference in term of sensitivity, specificity, accuracy, and diagnosis accordance rate of organ injury in the abdomen (P>0.05). Therefore, appropriate diagnosis methods should be selected according to the actual conditions of patients in clinics.

Conclusion

B-ultrasonography and CT scan present similar results in abdominal trauma diagnosis. These techniques are noninvasive, simple to operate, and worthy of further clinical promotion and application.

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*Correspondence to

Xiang Li

Department of Radiology

Wuhan Central Hospital

Affiliated to Tongji Medical College of Huazhong University of Science and Technology

PR China