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Is sentinel clot sign on computed CT scan helpful in localization of primary site of bleeding in patients with blunt abdominal trauma: A retrospective study

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Abstract

Aims and objectives: To evaluate the frequency and relevance of the "sentinel clot" sign on computed tomography scan (CT scan) for patients with blunt abdominal injury in a retrospective study.

Materials and Method: We retrospectively reviewed the CT log books and surgical registry to find the records of all patients who had CT scans done for blunt abdominal trauma during the period of 1st January 2019 to 15th May 2019. Excluding cases of retroperitoneal injury, bowel and mesenteric injuries, incomplete records, or inconclusive proof of diagnosis, we found a total of 50 visceral injuries in 42 patients.

Results and Observation: Of the total 50 visceral injuries in 43 patients, 2 cases had insufficient intraperitoneal blood to evaluate further. Of the remaining 48 injuries, 36 had evidence of a sentinel clot and 12 had generalized haemoperitoneum but no focal clot (Table 1). In 28 (78%) of the 36 cases with sentinel clot, CT also visualized a visceral injury; however, in 8 cases (22%), the sentinel clot was the only clue as to the site of injury.

Conclusion: Detection and localization of the sentinel clot sign may improve the accuracy of CT in the diagnosis of primary organ of injury in blunt abdominal trauma.

Keywords: sentinel clot sign, blunt abdominal trauma, computed tomography scan (CT scan)

Introduction

Computed tomography (CT) plays a major role in the evaluation of patients with suspected intra-abdominal injury. It is accurate in defining visceral injuries and associated haemoperitoneum. But haemoperitoneum frequently is more apparent than visceral laceration or hematoma itself [1, 2]. Clotted blood has a different CT appearance than lysed blood clot or free-flowing blood because of greater density and hemoglobin content [3-5]. It has been reported that perisplenic clot is an important clue in CT diagnosis of splenic injury [6]. Additional experience suggested that localized clotted blood ("sentinel clot") was a consistent and valuable sign in other visceral injuries as well. In order to evaluate the frequency and validity of the sentinel clot sign as an indication of a specific visceral injury, we retrospectively reviewed the medical records of 42 patients with confirmed traumatic abdominal injuries that had been studied by using CT.

Materials and Method

We retrospectively reviewed the CT log books and surgical registry to find the records of all patients who had CT scans done for blunt abdominal trauma in the department of Radiodiagnosis and imaging of Government medical College Srinagar, during the period of 1st January 2019 to 15th May 2019. Excluding cases of retroperitoneal injury, bowel and mesenteric injuries, incomplete records, or inconclusive proof of diagnosis, we found a total of 50 visceral injuries in 42 patients.

Observations and results

We found the sentinel clot sign to be a valuable adjunct in CT of abdominal trauma, being both sensitive and specific in identifying the injured organ. Sentinel clot was present in 36 (72%) of 50 visceral injuries. While CT visualized the parenchymal injury itself in 40 (80%) cases, the sentinel clot sign was the only clue as to the source of hemorrhage in 16% of cases.

In many cases, the sentinel clot was much more obvious than the parenchymal injury itself. (Table 1) The sentinel clot sign can increase the diagnostic accuracy of CT in identifying specific visceral injuries, particularly those of the spleen and liver. CT has proved accurate in the diagnosis of splenic trauma. Although an accuracy of 95% was reported in an earlier series, the actual splenic laceration or hematoma was visualized in only 71% [6]. Similarly, in the current report, 75% of patients had perisplenic clot, and in four (17%) of total splenic injuries the sentinel clot was the only sign of splenic trauma (Fig. 1 and Fig. 2). In such cases, surgical or pathologic findings usually indicated a small peripheral laceration or a central plane of laceration with little parenchymal hematoma.

Table 1: Shows the sentinel clot sign can increase the diagnostic accuracy of CT in identifying specific visceral injuries, particularly those of the spleen and liver

Site of injury	Sentinel clot present		Sentinel clot as:	
	Yes	No	Only finding	False positive
Spleen	18	06	04	0
Liver	14	03	03	0
Kidney	02	02	01	01
Pancreas	02	01	0	0
Total	36	12	8	01



Fig 1: Shows splenic injury with perisplenic hematoma. CT scan shows hyperdense clot relative to lower density of lysed blood surrounding spleen.

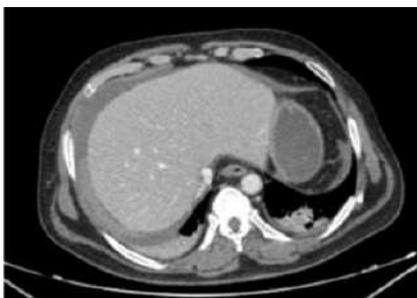


Fig 2: (false positive) Subhepatic hematoma in splenic injury with perisplenic hematomas. CT scan shows hyperdense clot relative to lower density of lysed blood surrounding the liver.

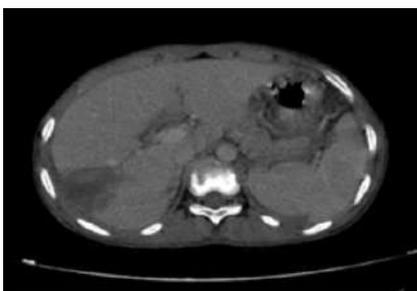


Fig 3: Shows subhepatic hematoma in hepatic injury. CT scan shows hyperdense clot relative to lower density of lysed blood surrounding the liver.

Hepatic laceration was the second most common injury and was easily diagnosed in most cases. Sentinel clot was frequent finding but in all our cases the hepatic laceration/hematoma was visualized directly. Similarly, in the current report 82% of patients had sub-hepatic, sub diaphragmatic clot (Fig. 3), and in three (21%) of total hepatic injuries the sentinel clot was the only sign of liver trauma

Other injuries were too few to evaluate conclusively. In our few cases of renal and pancreas injuries (seven cases), sentinel clot was present in 4 (57%) and was the only finding in one (14%) case of renal injury.

Discussion

Haemoperitoneum is present in nearly all patients with clinically important intraperitoneal injuries and is frequently present in patients with trivial self-limited injuries as well. If a protocol of surgery for all patients having haemoperitoneum, usually determined by diagnostic peritoneal lavage, is used, nontherapeutic laparotomy rates are 10-25% [7, 8]. Minor hepatic and mesenteric injuries are seen most often. Although peritoneal lavage is a sensitive indicator of intraperitoneal hemorrhage, it fails to detect the source or the significance of the bleeding [9]. Non-operative management of most abdominal visceral injuries is commonly accepted for pediatric patients who are hemodynamically stable.

CT has, nevertheless, proved valuable in evaluating the initial injury and the response to therapy [10]. In the adult population, CT has also proved to be extremely accurate in the diagnosis of abdominal visceral trauma, [2, 9].

Successful non-operative management of most patients with hepatic lacerations defined by CT has been demonstrated and is growing in acceptance [11, 12]. Several recent reports have suggested that CT can play an important role in the non-operative management of adult patients with splenic trauma, based on a scoring system that grades the parenchymal lesion and the extent of haemoperitoneum [13, 14]. CT has also shown promise in distinguishing "surgical" from "nonsurgical" cases of bowel and mesenteric injuries [15, 16]. The potential for CT to demonstrate and quantify haemoperitoneum and to evaluate its source is, therefore, of critical importance.

Intestinal and mesenteric injuries are difficult to diagnose by any means, including imaging, laboratory, physical examination, or peritoneal lavage. Accurate diagnosis with CT has recently been reported [15, 16], but demands excellent scanning technique including the use of oral contrast medium and appropriate image acquisition.

Conclusions

We conclude that localization of intra-abdominal blood clot is an important clue that the bleeding source is an injured adjacent organ, and that this sentinel clot sign is both sensitive and specific. Because management of hepatic, splenic, and other solid organ injury depends on identification of the source as well as the amount of hemorrhage, CT can have an important influence on management decisions and detection and localization of the sentinel clot sign may improve the accuracy of CT in the diagnosis of primary organ of injury in blunt abdominal trauma.

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