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Autotransfusion with Laparoscopically Salvaged Blood in Trauma: Report on 21 Cases

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Abstract [TOP](#)

Summary: Autotransfusion is being increasingly used to avoid the complications of homologous blood transfusion. In abdominal trauma, however, the collected blood may be contaminated by intestinal contents when digestive or urinary lesions are present. In such situations, the reinfusion of blood is contraindicated. We present our experience with autotransfusion of blood collected by laparoscopy from the abdominal cavity of 21 trauma patients. Laparoscopy allowed the aspiration of blood and, at the same time, permitted diagnosis of visceral lesions, avoiding reinfusion of contaminated blood. No complications occurred, and hematocrit values were significantly elevated. This procedure may represent the only possible method of blood transfusion in Jehovah's Witnesses, as with one patient in our series.

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The salvage and autotransfusion of shed blood in trauma victims is a widely practiced technique that has many advantages compared with the transfusion of banked blood. Autotransfusion reduces the need for cross-matched blood, thereby alleviating the risk of transmission of hepatitis, human immunodeficiency virus (HIV), and syphilis and the avoidance of transfusion reactions (1).

The treatment of blunt abdominal trauma has markedly changed in recent years toward a more conservative regimen. It has been established that abdominal bleeding following blunt trauma with injury to the liver has ceased at the time of laparotomy in more than 50% of cases and could therefore be managed nonsurgically (2). The nonoperative management of blunt hepatic and spleen trauma is well accepted for pediatric patients and has been advocated for selected adults in some centers (3,4). In general, patients with blunt trauma selected for conservative therapy are hemodynamically stable or become stable after initial resuscitation.

Trauma patients are often unstable or unconscious, and it is frequently difficult to reach an early and correct clinical judgment on the existence and extent of intra-abdominal viscus injury (5-7). Use of laparoscopy as a diagnostic tool in abdominal trauma patients whenever initial evaluation does not exclude the possibility of intraperitoneal injury has proved efficient and can reduce the incidence of unnecessary exploration for abdominal trauma in which hemoperitoneum exists, as suggested by many authors (5-7).

Because conservative treatment is a reasonable option in selected hemodynamically stable patients with hemoperitoneum from blunt injuries to the liver and spleen (3,4), laparoscopy can be a useful adjunct in the nonoperative management of this condition.

Therefore, the advantages of autotransfusion can be gained via laparoscopy aided blood salvage in a combination of these two technologies, especially in the stable patient, without the need for laparotomy.

MATERIALS AND METHODS [TOP](#)

This study consisted of 21 patients treated over a 4-year period in the emergency department of the School of Medicine University of São Paulo, all of whom had sustained abdominal trauma (19 blunt, two penetrating trauma) with hemoperitoneum. The quantitative assessment of hemoperitoneum is difficult, but an impression can be gained using Berci's classification (5). The hemoperitoneum was diagnosed during diagnostic laparoscopy in traumatic acute abdomen. All patients underwent laparoscopy because the initial evaluation did not lead to an accurate diagnosis of an eventual intra-abdominal viscus injury. Patients whose initial diagnosis was easily made were immediately submitted to surgery and were not examined by laparoscopy.

Patient ages ranged from 4 to 90 years (mean, 29). The trauma score was 16 in 12 patients, 15 in four, 13 in three, and 11 in two. For preparatory antisepsis of the abdominal wall, 2% iodated alcohol was used, and local anesthesia with lidocaine was given to 15 adult patients, as suggested by many authors (5-9). Five children and one adult undergoing orthopedic surgery were given general anesthesia (8,9).

Laparoscopy with a Storz laparoscope (11 mm) was performed after percutaneous perforation of the peritoneal cavity with a Verres needle, generating a pneumoperitoneum of no more than 2 L by insufflation of carbonic gas.

The autotransfusion was performed only after laparoscopic diagnosis of moderate or severe hemoperitoneum and absence of gastrointestinal lesions, avoiding the reinfusion of contaminated blood. Gastrointestinal lesions seen by direct inspection were considered an indication for immediate surgery. If several hours had elapsed between the trauma and admission, and if injuries to underlying organs could not be seen, they might be suspected by indirect signs (5). We use an autotransfusion pump with a filter and no heparin solution as described by Symbas (10). Statistical analysis of the individual patient changes in hematocrit, pretransfusion, and post-transfusion, was performed using paired *t*-test.

RESULTS [TOP](#)

Seventeen patients had moderate hemoperitoneum, and four had severe hemoperitoneum according to Berci's classification (5). Laparoscopy documented hepatic injuries in 10 patients, splenic lesions in seven, falciform ligament lesion in one. In three patients, the bleeding site was not found. Although perforation of the retroperitoneum segment of the duodenum and pancreatic injuries could escape laparoscopic detection, no injuries were missed at laparoscopy. Six patients presenting low initial systolic blood pressure (70-90 mm Hg) required infusion of saline solution (500-1,000 ml) before laparoscopy and underwent this procedure under stable hemodynamic conditions.

The average blood volume of autotransfusion was 600 ml (450-1,200 ml). The mean hematocrit value before the autotransfusion was $28.1 \pm 3.2\%$ and afterward 33.9 ± 2.9 . This difference was statistically significant ($p < 0.0001$). No patients required further blood transfusion.

Eleven patients in this series required no surgery, and 72-h follow-up showed no complications. Seven patients underwent surgery, and all the laparoscopic findings were confirmed in laparotomy. Two patients died from cranioencephalic trauma, but the laparoscopic findings were also confirmed at autopsy. There were no laparoscopic complications in this study.

DISCUSSION [TOP](#)

Autotransfusion of shed blood, a technique that was first described more than 100 years ago by Duncan (11), is a potentially valuable tool in the resuscitation of hypovolemic trauma patients (12). Despite subsequent early reports advocating the use of autotransfusion, the technique did not gain wide acceptance in the clinical setting until the past 15 years (13,14). The efficacy of salvaging blood from injured patients has been demonstrated in all phases of trauma care. Recent reports call for the increased use of autologous blood transfusion in the treatment of trauma patients as well as in elective surgical practice. The risk of transmission of hepatitis, HIV, and other infectious agents is eliminated. Reactions to transfusions are also avoided, and the cost and delays of cross-matching banked blood products are minimized (1).

Reports from as early as 1976 have advocated the use of laparoscopy in the evaluation of patients suspected of having intra-abdominal injury (6). More recently, the use of the laparoscopy with the patient under local anesthesia and sedation with a small

pneumoperitoneum has been described by Berci (5) as an accurate technique for the evaluation of blunt abdominal trauma in the emergency department. Laparoscopy is an efficient diagnostic tool in abdominal trauma patients whenever initial evaluation does not exclude the possibility of intraperitoneal injury and has been used in the evaluation of abdominal trauma in the emergency department of the School of Medicine University of São Paulo since 1986 (7).

The main indications for emergency diagnostic laparoscopy are (a) mental incapacity for any reason (head trauma, alcoholism, drug ingestion, disease state), (b) history or evidence of blunt abdominal trauma or abdominal stab wounds, (c) unexplained hypotension, or (d) equivocal signs on physical examination (5). Patients with gunshot wounds to the abdomen have not been examined by laparoscopy. However, small or questionable penetrating stab wounds are not contraindications to laparoscopy as was this case in two of our patients.

Laparoscopic visualization of the entire intestine is not always possible, but the diagnosis of gastro-intestinal lesions can be made indirectly by identification of intestinal contents. Therefore, when digestive or urinary lesions are present, the reinfusion of blood is contraindicated.

A major stimulus to the use of autologous blood has been the problem of obtaining sufficient supplies of compatible donated blood, especially for emergency surgery. The salvage of uncontaminated blood loss into body cavities and its subsequent reinfusion can be a simple, cheap, life-saving procedure (15,16).

The high incidence of negative or nontherapeutic laparotomy after abdominal trauma can be explained by the frequency of positive lavage results from a laceration of the liver or spleen that has stopped bleeding at laparotomy. Neither wound exploration nor peritoneal lavage can accurately identify these patients. Recent interest in nonsurgical management of selected patients with hemoperitoneum makes laparoscopic examination desirable in defining the injury to identify patients who can be observed successfully (17).

Because the salvage of intraperitoneal blood for autotransfusion is well accepted, and laparoscopic examination has been gaining popularity for the diagnosis and evaluation of the trauma victims, the combination of these techniques may facilitate autotransfusion and avoid laparotomy as recently reported by Smith et al. (1).

Laparoscopic removal of hemoperitoneum with salvage of blood and autotransfusion may represent the only possible method in Jehovah's Witnesses, as in one patient of this series.

REFERENCES TOP

1. Smith RS, Meister RK, Tsoi EKM, Bohman HR. Laparoscopically guided blood salvage and autotransfusion in splenic trauma: a case report. *J Trauma* 1993;34:313.
[\[Medline Link\]](#) [\[Context Link\]](#)
2. Andersson R, Bengmark S. Conservative treatment of liver trauma. *World J Surg* 1990;14:483.
[\[Medline Link\]](#) [\[Context Link\]](#)
3. Delius RE, Frankel W, Coran AG. A comparison between operative and nonoperative management of blunt injuries to the liver and spleen in adult and pediatric patients. *Surgery* 1989;106:788.
[\[Context Link\]](#)
4. Hiatt JR, Harrier D, Koenig BV, Ransom KJ. Nonoperative management of major blunt liver injury with hemoperitoneum. *Arch Surg* 1990;125:101.
[\[Medline Link\]](#) [\[Context Link\]](#)
5. Berci G, Dinkelman D, Michel SL, Sanders G, Wahlstrom E, Morgenstern L. Emergency minilaparoscopy in abdominal trauma. *Am J Surg* 1983;1146:261.
[\[Context Link\]](#)
6. Carnevale N, Baron N, Delany HM. Peritonioscopy as an aid in the diagnosis of abdominal trauma: a preliminary report. *J Trauma* 1977;17:634.
[\[Context Link\]](#)
7. Zantut LFC, Rodrigues AJ Jr, Birolini D. Laparoscopy as a diagnostic tool in the evaluation of trauma. *Panama J Trauma* 1990;2:6.

[\[Context Link\]](#)

8. Cortesi N, Zambarda E, Manetti A, Gibertin G. Laparoscopy in routine and emergency surgery. *Am J Surg* 1979;137:647.
[\[CrossRef\]](#) [\[Medline Link\]](#) [\[Context Link\]](#)
9. Rachail M, Corallo J, Maurel G. La laparoscopie en urgence. *Arch Fr Mal App Dig* 1974;63:103.
[\[Medline Link\]](#) [\[Context Link\]](#)
10. Symbas PN. Extraoperative autotransfusion from hemotorax. *Surgery* 1978;84:722.
[\[Medline Link\]](#) [\[Context Link\]](#)
11. Duncan J. On re-infusion of blood in primary and other amputations. *Br Med J* 1886;1:192.
[\[Context Link\]](#)
12. Plaisier BR, McCarthy MC, Canal DF, Solotkin K, Broadie TA. Autotransfusion in trauma: A comparison of two systems. *Am Surg* 1992;58:5621.
[\[Context Link\]](#)
13. Mattox KL. Autotransfusion in an emergency department. *J Am Coll Emerg Phys* 1975;4:218.
[\[Context Link\]](#)
14. Giordano GF, Giordano DM, Wallace BA, Giordano KM, Prust RS, Sandler SG. An analysis of 9,918 consecutive perioperative autotransfusions. *Surg Gynecol Obstet* 1993;176:103.
[\[Medline Link\]](#) [\[Context Link\]](#)
15. Page RJE, Wilson IH. Autologous transfusion. *Br Med J* 1990;300:1139.
[\[Context Link\]](#)
16. Chant ADB, Thompson JF. Autotransfusion with salvaged blood. *Br J Surg* 1992;79:389.
[\[Medline Link\]](#) [\[Context Link\]](#)
17. Ivatury RR, Simon RJ, Weksler B, Bayard V, Stahl WM. Laparoscopy in the evaluation of the intrathoracic abdomen after penetrating injury. *J Trauma* 1992;33:101.
[\[Context Link\]](#)

Keywords:

Autotransfusion; Blood transfusion; Abdominal trauma; Contaminated blood

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