CASE REPORT

Paintball-related traumatic liver injury

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SUMMARY

Paintball is a popular recreational sport played at both amateur and professional level. Ocular injuries are well recognised, although there is a growing body of literature documenting superficial vascular as well as deep solid organ injuries. An 18-year-old man presented with signs and symptoms consistent with acute appendicitis. Intraoperatively, a grade III liver injury was identified and packed before a relook at 48 h. No further active bleeding was identified; however, follow-up ultrasound at 3 weeks demonstrated non-resolution of a large subcapsular haematoma. The patient was readmitted for a short period of observation and discharged with repeat ultrasound scheduled for 3 months. This represents the first report of paintball-related blunt traumatic injury to the liver. Solid organ injuries of this nature have only been reported three times previously—all in the urological setting. This case also highlights issues surrounding the use of routine follow-up imaging in blunt liver trauma and provides a concise discussion of the relevant literature.

CASE PRESENTATION

An 18-year-old man presented with a 1-day history of periumbilical pain radiating to the right iliac fossa, associated with low-grade fever and anorexia. There were no other symptoms. On examination, he was tender in the right iliac fossa. Admission bloods demonstrated a white cell count of $11.6 \times 10^9/L$, C reactive protein 50 mg/L and haemoglobin 115 g/L.

The patient was clinically diagnosed with acute appendicitis and placed on the emergency list. At this stage, his anaemia was not thought to be clinically relevant—particularly in the absence of a history of trauma. It was planned to investigate this further postoperatively with appropriate referral to haematology if required.

TREATMENT

At laparoscopy, a large volume of frank and partially clotted blood was found in the peritoneal cavity. The operation was converted to a midline laparotomy and four-quadrant packing performed.

Careful removal of the packs revealed that the spleen, small bowel, stomach, colon and retroperitoneal great vessels were all intact. There was no evidence of iatrogenic injury.

However, inspection of the liver revealed a large subcapsular haematoma of the right lobe with a capsular breach in segment VIII posteriorly. The grade III injured liver was then re-packed and intraoperative haemoglobin was 119 g/L.

At reinspection, persistent ooze was noted, so a haemostatic agent (Surgicel) was applied locally

and the liver repacked with a view to re-exploring at 48 h. This was in close consultation with the regional hepatobiliary trauma unit. An immediate postoperative triple phase contrast CT is shown in figures 1 and 2.

Subsequent questioning of the patient revealed a recent history of trauma to the right upper quadrant, sustained 2 days prior during a paintball game at a commercial site. Although there was evidence of neither 'paintball purpura'¹ nor focal ecchymoses on the abdomen, the patient described receiving two 'hits' below the costal margin on the right-hand side.

Re-exploration at 48 h and removal of the packs demonstrated no ongoing bleeding and no injury to the biliary tree. The patient returned to the ward and was discharged after an uncomplicated recovery.

OUTCOME AND FOLLOW-UP

The patient was readmitted 3 weeks later after a privately organised ultrasound scan demonstrated non-resolution of the haematoma, although the patient remained asymptomatic. His readmission haemoglobin was 137 g/L. At CT, a persistent large subcapsular haematoma measuring $13.5 \text{ cm} \times 10.1 \text{ cm} \times 16.5 \text{ cm}$ was demonstrated, shown in figure 3.

After further discussion with the hepatobiliary trauma unit, this was managed conservatively and the patient discharged after 3 days of uneventful observation. A repeat ultrasound has been scheduled for 3 months.

DISCUSSION

This represents the first report of paintball-related blunt traumatic injury to the liver.

Solid organ injuries of this nature have only been reported three times previously. In the first report, a subcapsular haematoma of the kidney was

Figure 1 Postoperative CT (axial slice): large liver haematoma visible with areas of clot formation. Mild streaking artefact secondary to patient's arm position.

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Figure 2 Postoperative CT (coronal slice): infrahepatic radiolucency represents surgical packs later removed at re-look laparotomy.

successfully managed conservatively (with serial CT imaging demonstrating complete resolution at 9 months),² whereas two urological cases—of penoscrotal lymphoedema³ and testicular rupture⁴—required surgical intervention.

Vascular injuries secondary to paintball pellets are well recognised, although these typically involve the superficial scalp vessels. Traumatic pseudoaneurysm of both the occipital⁵ and superficial temporal artery⁶ has been well described, although there are no documented cases of internal or deep vascular injuries.

There appears to be little role for the use of routine follow-up imaging in blunt liver trauma. In one large trial of 530 patients managed non-operatively, the authors identified no benefit of reimaging at <1 week, demonstrating that the majority of cases remained either unchanged (51%) or improved (34.7%).⁷ Indeed, only three patients required intervention based on their repeat scan findings.

Together with a number of other studies, these data have been incorporated into the most recent Eastern Association for the Surgery of Trauma practice guidelines for the non-operative

Figure 3 Delayed CT (3 weeks postinjury): persistent large subcapsular haematoma (measuring 13.5 cm×10.1 cm×16.5 cm).

management of blunt hepatic injury.⁸ The authors state that ‘routine follow-up CT scans are not necessary’ and that ‘repeated imaging should be guided by a patient’s clinical status’. It is worth highlighting, however, that they are only able to provide level 3 support for this recommendation (ie, ‘supported by available data’ but lacking ‘adequate scientific evidence’).

Overall then, it appears that routine follow-up CT imaging is not indicated in the non-operative setting. Whether this remains true for patients who undergo surgical intervention remains unclear.

Likewise, although patients are advised to avoid strenuous activities for several weeks or longer, there are no evidence-based recommendations regarding the need for or duration of reduced physical activity.^{8,9} Most advice is intuitive with lengthier restrictions placed on higher grade injuries, although it is not clear how this influences the risk of reinjury, if at all.

This case report adds to the growing literature on paintball-related injuries.¹⁰ Pellets with muzzle velocities of 100–300 feet/s¹¹ are potentially harmful to ocular structures¹² and also to the intra-abdominal solid organs. Participants and physicians must both be aware of the possible dangers associated with this recreational sport.

Learning points

- ▶ This is the first report of paintball-related traumatic liver injury.
- ▶ Paintball pellets are known to be harmful to ocular structures but are increasingly associated with vascular and solid organ injuries.
- ▶ Follow-up imaging in blunt hepatic trauma should be guided by the patient’s clinical status; there is no clear benefit of routine follow-up CT scans, particularly in the non-operative setting.

Competing interests None declared.

Patient consent Obtained.

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