Asymptomatic lithogenic bile in Greek complete high spinal cord injured (SCI) males: An acute phase complication?

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Purpose

Spinal cord injury (SCI) is characterised by dysfunction of nervous system due to motor and sensory disruption below the level of injury. Recent studies have suggested that SCI is a risk factor for the development of gallstones and biliary sludge, especially during the first months after injury onset.

In these patients the dysfunction of the autonomic nervous system establishes within six months of SCI, therefore neurological instability effects on gallbladder function are more prominent within that period. The aim of this study was to assess by ultrasonography (US) of lithogenic bile presence in asymptomatic Greek male patients with complete SCI, above the 7th neural segment (T7), in the early post-injury onset, in order to evaluate the neurological instability effects on the gallbladder function.
Methods and Materials

57 asymptomatic males (mean age 32.6 years) with complete high SCI above T7, undergoing US of the gallbladder and common bile duct for biliary sludge and gallstones investigation within the first six months from the injury. All patients had complete neurological damage of the motor and sensory functions with no movement or sensation below the lesion (ASIA A) according to the classification of the American Spinal Injury Association (ASIA).

The control group consisted of 59 healthy male volunteers (mean age 33.1 years) matched for age and race. In all individuals, the body weight was within or slightly below normal limits. Risk factors for the development of gallstones, such as obesity, diabetes mellitus, biliary infection, alcoholic cirrhosis, haemolytic anaemias and oral contraceptives, were not reported in either group.

The SCI patients were examined 105 ± 22 days after the trauma and all cases within the six months from the injury onset. Ultrasonographical examinations were performed using two echo units (HDI 5000 and HDI 3500, ATL Ultrasound Inc, Bothell, WA, USA) equipped with a high-resolution 2-5 MHz curved transducer.
Results

The chi-square test was used for the statistical analysis. A p-value < 0.05 was regarded as significant.

The presence of biliary sludge was significantly higher in SCI males compared to healthy subjects (p<0.001). Small (<0.5cm), not strongly echogenic gallstones were found in 5 male patients (8.7%) with post-injury duration longer than 4 months, compared with 2 of the control group (3.38%), but this difference was not statistically significant (p=NS). The total number of patients with gallstones and biliary sludge was significantly increased compared to controls (p<0.001). No patient presented simultaneously biliary sludge and gallstones at the same US examination. No patient developed sludge or lithiasis in common bile duct.

Table I. Chi-square test results for incidences of biliary sludge and gallstones between SCI male patients and normal male subjects.

<table>
<thead>
<tr>
<th>Studied variable</th>
<th>No. (%) of cases (n = 57)</th>
<th>No. (%) of controls (n = 59)</th>
<th>p-value ($^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge</td>
<td>12 (21.05)</td>
<td>0</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Stones</td>
<td>5 (8.77)</td>
<td>2 (3.38)</td>
<td>0.205</td>
</tr>
<tr>
<td>Sludge and stones</td>
<td>17 (29.82)</td>
<td>2 (3.38)</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Conclusion

In this study, we evaluate by ultrasonography male patients with complete SCI (ASIA A) above the T7 segment within the first six months of the injury, in order to investigate the effects of neurological instability and SNS dysfunction in the gallbladder and common bile duct within the early post-SCI phase. SCI patients injured above T7 segment have a complete disruption of the SNS. This disruption reduces the normal post-injury gallbladder motility leads to gallbladder stasis and probably predisposes to an increased incidence of biliary sludge and gallstones.

Our results showed a significantly higher number of male patients with biliary sludge compared to the healthy male controls within the first six months of the injury onset, but no significant difference in the incidence of gallstone formation was observed between male patients and healthy subjects. Also the total number of male patients with gallstones and biliary sludge was significantly higher compared with the control group (Table I). In recent study, Rotter et al. revealed a higher prevalence of biliary sludge and lithiasis, as a late SCI phase complication in male SCI patients. Also previous investigations exhibited a high frequency of sludge bile formation particularly in high SCI patients during the early phase after an injury.

In all cases of cholelithiasis, the development of gallstones was observed after four months of injury, all gallstones were small in diameter (< 5.0 mm) and not strongly echogenic. This implies that interference with the neurological instability to the gallbladder in the early post-SCI phase may play an important role in the development of lithogenic bile. Probably in these male patients biliary sludge formation might be a prefatory stage for the development of gallstones during the first six months from the injury onset.

In conclusion our data indicate that gallbladder sludge and gallstones formation are significantly higher in Greek complete high SCI males at the early post-SCI phase. The complete neurological disruption and instability is probably responsible for lithogenic bile. Routine US should be performed in these patients at the acute SCI phase for the early diagnosis of cholelithiasis.
Fig. 0: Transverse view of the gallbladder in a male high S.C.I. patient demonstrate a smooth ovoid relatively high hyperechoic mass within the gallbladder lumen representing a tumefactive biliary sludge.

**Fig. 0:** A sagittal view of the gallbladder in a male high S.C.I. patient demonstrate a slightly echodense gallstone (arrow) in the dependent portion of the gallbladder.

Fig. 0: A left lateral decubitus axial scan in a male high S.C.I. patient show a small gallstone with a diameter of 0.27cm, moving to the dependent portion of the gallbladder. A acoustic shadowing is seen deep to the gallstone.

References


