Case Report

First Report of Gallbladder Volvulus Managed with a Robotic Approach

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Gallbladder volvulus (GV) is an axial twisting of the gallbladder (GB). If not treated on time, this condition has a mortality up to 6%. It is usually diagnosed intraoperatively, because it can mimic a typical acute cholecystitis. An 81-year-old female patient presented with an acute onset of right upper quadrant pain accompanied with nausea. The patient was admitted to receive treatment for acute cholecystitis after the findings of ultrasound imaging. Robotic-assisted cholecystectomy was the approach chosen. GV was diagnosed after initial diagnostic laparoscopy. Cholecystectomy was performed uneventfully. Indocyanine green fluorescence was used to assess the biliary anatomy. The postoperative course went uneventful. The patient was discharged home on postoperative day 2.

1. Background

Management of acute cholecystitis has been proven to be safe in the minimally invasive setting, even for elderly patients [1]. Nevertheless, when decision is made to take the patient to the operating room, gallbladder volvulus (GV) is an unexpected finding that usually is discovered intraoperatively [2].

GV is defined as an axial twisting of the gallbladder (GB), with subsequent interruption of the vascular and biliary flow [3]. As a consequence, GB necrosis and inflammation are manifested as an acute abdomen [2]. This condition was described for the first time by Wendell in 1898. Since then, approximately 400 cases have been reported in literature [4]. Throughout the years, an increase of reports has been observed, especially in Japanese literature [3], possibly due to increased life expectancy and the fact that GV is more frequent in the elderly [4].

Robotic-assisted surgery has had an exponential growth in the last two decades, but its use in the acute setting has still to be fully explored [5, 6]. Herein, we report the 1st case of GV managed with this novel surgical approach.

2. Case

This 81-year-old female presented to the emergency room with an acute onset of nonradiating and sharp right upper quadrant (RUQ) pain, primed by food intake and associated with nausea and fever (38.8°C). Past medical history was significant for hypertension, allergic sinusitis, and multiple abdominal surgeries (partial hysterectomy, right salpingo-oophorectomy, and open adhesiolysis for small bowel obstruction). Labs were unremarkable; WBC and liver function parameters were within normal limits. Abdominal and pelvic CT scans showed a dilated GB with large (5.4 cm) stone without signs of cholecystitis (Figure 1). RUQ ultrasound (US) reported a GB with marked wall thickening, pericholecystic fluid, and positive sonographic Murphy’s sign (Figure 2). The patient was admitted from the emergency department to medical service to receive treatment for acute cholecystitis with IV antibiotics and pain management.

Shortly thereafter, the patient developed atrial fibrillation with rapid ventricular response, which required consultation and treatment by the cardiology consultant.
Trocars were then placed according to standard con-
and uneventful adhesiolysis was carried out. The robotic
were placed cephalad and caudal to the prior. Successful
laparoscopy showed numerous omental and intestinal adhe-
seek the laparoscopic camera. The initial diagnostic
in reverse Trendelenburg, and the Da Vinci Xi® cart
wanted down with the cautery hook. Hemostasis was checked before the specimen was retrieved in an
The patient was transferred to the recovery room
operatory course went uneventful; the patient was
The pathology report informed gangrenous cholecystitis.

3. Discussion
GV is a rare condition that occurs after the GB twists around
its mesentery [9]. It most frequently affects the elderly
(seventies and eighties) and more commonly women at a
ratio of 3:1 compared to men [9]. The main postulated
contributing factors are loss of visceral fat, liver atrophy,
and long mesentery [2]. These conditions result in a floating
GB, predisposed to torsion [2]. Other precipitating factors
that have been hypothesized are “violent” peristalsis of the
neighboring organs, kyphosis, and atherosclerosis of the
cystic artery [10]. The role of gallstones seems to be less
relevant, because more than half of the patients with GV does
not have gallstones [2].

According to the classification by Gross [11], free floating
GBs can be classified into two groups: type A, when the
mesentery supports the GB and the cystic duct, and type B,
in which the mesentery only supports the cystic duct. In this
case, the floating GB adopted the type A configuration.

Clinical symptoms are nonspecific, usually mimicking
an acute cholecystitis (e.g., abdominal pain, nausea and
vomiting, and palpable mass in RUQ). This is the reason
why a high level of suspicion is a key. The low frequency of
fever and jaundice, associated with a poor response to antibi-
otic therapy, may contribute to the differential diagnosis
from acute cholecystitis [3]. If surgical intervention is
delayed, due to GB necrosis and perforation, mortality asso-
ciated due to GV is 6% [9]. The triad described by Lau et al.
[12] may help to identify the patients who are more likely
to present GV: (1) appearance (elderly, thin, and spinal
deformities), (2) symptoms (sudden onset, early emesis,
and RUQ pain), and (3) examination (nontoxic presentation,
palpable abdominal mass, and pulse-temperature discrep-
ancy). Laboratory results are usually nonspecific: while liver
function tests are commonly under normal limits, elevated
WBC is a frequent finding [10]. This stand in contrast to
our case, in which WBC was under the normal limits.
Preoperative diagnosis of GV can be challenging, and most images may be interpreted as acute cholecystitis, especially if lithiasis is present [13]. Ultrasonography may describe a large and freely mobile GB, with a markedly thickened and multilayered wall [3]. In our case, acute cholecystitis signs were found, but freely mobile GB was not described. Naganuma et al. [14] proposed that color Doppler US may contribute to the differential diagnosis, because blood flow to the GB is interrupted in the setting of GV, whereas the flow of the cystic artery along the wall can be observed in acute cholecystitis. CT scan findings related to GV are distended GB, abrupt angulation of Hartmann’s pouch, and change of the anatomical position of the GB from vertical to horizontal [13]. MRI may show high signal intensity within the GB wall on T1 signal (finding consistent with necrosis and hemorrhage) [10]. Finally, use of hydroxyiminodiacetic acid (HIDA) scan was described in literature. A “bulls-eye” configuration from the accumulation of radioactivity in the GB can be observed in this case [15].

Surgical management must not be delayed if diagnosis is made preoperatively. A minimally invasive approach should be the first choice [10]. Despite being a relatively easy surgery (considering that almost no detachment from the liver bed is
required to perform the cholecystectomy), attention should be paid to the proper identification of the structures of the hilum. Calot’s triangle may be distorted due to the abnormal position of the structures [16], so it is recommended to assess the anatomy with diagnostic imaging. Intraoperative cholangiogram is advised for the laparoscopic approach in order to avoid an unwanted biliary injury [17], but with the robotic approach, this is not necessarily required due to the integration of ICG fluorescence into the platform [6]. In our case, obtained near-infrared images with the aforementioned technique allowed to clearly identify the biliary structures, as seen in Figure 3.

Robotic surgery is on the rise. This novel technology is now used not only for routine but also for complex procedures [18, 19]. Despite the growth and expansion of applications, the use of the robotic platform in acute care surgery is still not fully explored [6]. Our case report presents a rare condition of the GB that has been successfully managed with the robotic approach in the acute setting [8]. Nevertheless, the laparoscopic approach, with widespread availability, lower costs, and proven safety [20], is still a valid approach for this pathology.

The magnified 3D vision, the finer dissection facilitated by instruments with Endowrist® (articulation in the distal part of the instrument that allows reproducing the freedom of movement of the human wrist), and the real-time assessment of biliary anatomy using ICG-aided cholangiography were perceived by the surgical team as added benefits to the more traditional laparoscopic approach. However, further evidence is necessary to show an obvious advantage of the robotic approach in the management of this rare and acute condition in comparison to the widely accepted laparoscopy.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal on request.

Conflicts of Interest

The authors declare no competing interests.

References
