



## WEeping PERITONITIS: A CASE SERIES AND REVIEW OF LITERATURE OF CHEMICAL PERITONITIS POST LAPAROSCOPIC SURGERY.

### Surgery

**Dr Madhuri Jain** Department Of Gastrointestinal And General Surgery, Zen Multispeciality Hospital.

**Dr Vishakha Kalikar** Department Of Gastrointestinal And General Surgery, Zen Multispeciality Hospital.

**Dr Roy Patankar** Department Of Gastrointestinal And General Surgery, Zen Multispeciality Hospital.

**Dr Advait Patankar** Department Of Gastrointestinal And General Surgery, Zen Multispeciality Hospital.

### KEYWORDS

Chemical Disinfectants Peritonitis

### INTRODUCTION

Laparoscopic surgery is associated with a very rare complication of postoperative ascites and peritonitis for which no cause can be found, after extensive imaging and biochemical studies. In such cases, inflammatory reaction or idiopathic allergic response of peritoneum may be considered as diagnosis of exclusion.<sup>1</sup>

Glutaraldehyde is a commonly used disinfectant, for quick disinfection of laparoscopic instruments which are not amenable for sterilization in an autoclave.<sup>2</sup> The toxic effects of glutaraldehyde on the respiratory and gastrointestinal systems have been widely reported and discussed in the literature.<sup>3</sup>

We present a case series of four patients who developed exudative Ascites of unknown origin after laparoscopic hysterectomy and cholecystectomy. After reviewing literature pertinent to the same we found a few reports suggestive of a reaction to CO<sub>2</sub>, glutaraldehyde, formaldehyde or electro surgical causes attributing to rarest causes of Ascites.<sup>4</sup>

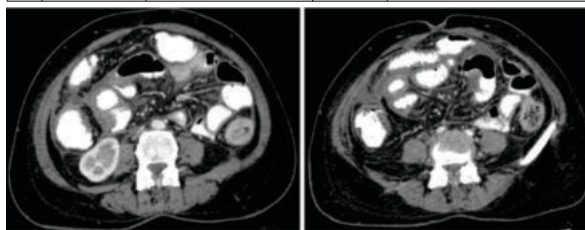
Small amounts of glutaraldehyde left as residue in the scopes, which if not washed may cause chemical burns causing bowel injury. The aim of this series is to create awareness and prevent such future injuries.

### METHODS

This is a retrospective observational study carried out at a tertiary care Multi specialty hospital in Mumbai. All the patients were operated for laparoscopic hysterectomy and one with additional cholecystectomy outside and referred to our hospital after trial of conservative care. The presenting age group being 37 to 49 years. The patients presented with increasing abdominal pain, distention and non-bilious vomiting from post operative day 5 to day 27 before they were referred to our center. They had increased total leucocyte counts, increased C-RP > 100 and ESR > 100. Any solid or hollow viscus injury was ruled out on contrast enhanced computed tomography. Ultrasound guided aspiration of the fluid was done in all the patients which was negative for PCR, AFB smear and culture negative, cytology negative for malignancy, increased protein, ADA was normal and there was no growth of any organism on culture. Routine microscopy showed exudative ascites with no bile salts or bile pigments. The bile being negative, ruled out biliary peritonitis, also the fluid was not white or yellow in colour. All the pre-operative work up and ultrasonography of these patients were in normal limits before the first laparoscopic surgery. On Detailed history and reviewing modes of sterilization / disinfection we noted that all primary surgeons used glutaraldehyde for scope and instrument disinfection. On an average around 50– 100 laparoscopic surgeries per year in those centers.

| Patient | Age of patient | Symptoms                                                           | Day of presentation | Previous surgery          |
|---------|----------------|--------------------------------------------------------------------|---------------------|---------------------------|
| 1       | 47/ female     | Periumbilical pain, distension                                     | Pod 25              | Laparoscopic Hysterectomy |
| 2       | 49/ female     | Diffuse abdominal pain, bilious vomiting and distension of abdomen | Pod 14              | Laparoscopic Hysterectomy |

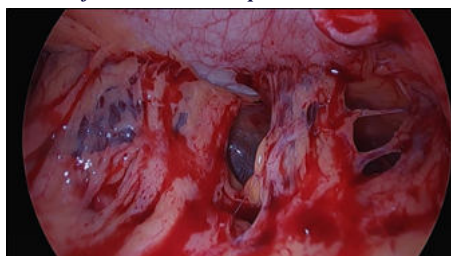
|   |            |                               |        |                                            |
|---|------------|-------------------------------|--------|--------------------------------------------|
| 3 | 39/ female | Vomiting, periumbilical pain  | Pod 10 | Laparoscopic Hysterectomy, cholecystectomy |
| 4 | 46/ female | Pain in abdomen, loose stools | Pod 11 | Laparoscopic Hysterectomy                  |



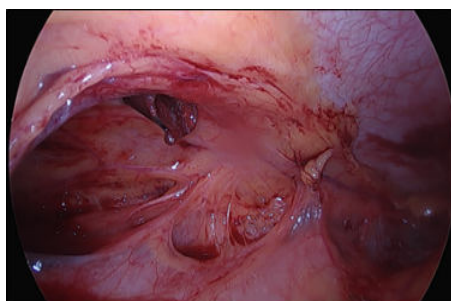
**Figure1. Contrast CT showing dilated bowel loops with thickened walls and peritoneal adhesions**



**Figure2. Ascitic fluid in Morrison's pouch**



**Figure3. Omental adhesions**



**Figure4. Peritoneal adhesions**

All the patients were started on empirical broad-spectrum antibiotics and kept nil by mouth. They were kept nil by mouth. Two patients didn't respond to conservative line of management, underwent therapeutic ascitic tapping. All the patients were started on intravenous methylprednisolone 40 mg 24 hourly and switched to oral prednisone in tapering dose after the complaints settled and was discharged.

One patient who had a history of tuberculosis in the past, had CT suggestive of thickened peritoneal lining and bowel loops, there was clumped up bowel loops with increased mesenteric thickening with fluid in the abdomen.

So decision was taken to go ahead with a diagnostic laparoscopy.

| Patient | Contrast tomography                                                                                                                                                                                                               | Ascitic tapping                                                                                                       | Blood investigation                                                             | Management                                                                                                          | Histopathology                           |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1       | Diffusely enhancing long segment thickening of jejunal and ileal loops with clumping of bowel loops, peritoneal irregular thickening mesenteric, omental fat stranding, nodularity with ascites suggesting tubercular peritonitis | Bile salts and pigments – negative, Glucose of 120 mg/dl, Protein 4.1 g/dl and normal fluid amylase and lipase levels | PCT elevated<br>Complete blood count, renal and liver function – Normal limits. | Broad spectrum antibiotics,<br>Diagnostic laparoscopy with biopsy<br>Intravenous methylprednisolone, oral steroids. | Omental biopsy s/o chronic inflammation. |
| 2       | Ascites with peritoneal inflammation                                                                                                                                                                                              | Clear, yellow color fluid which was exudative in nature and negative for malignancy, tuberculosis or pancreatitis     | Elevated C-reactive protein, estimated sedimentation rate.                      | Empirical antibiotics and tapering doses of intravenous steroids<br>Ascitic tapping therapeutic                     | -                                        |
| 3       | Peritoneal inflammation and ascites                                                                                                                                                                                               | Exudative fluid                                                                                                       | Routine blood – normal range                                                    | Empirical steroid, antibiotic                                                                                       | -                                        |
| 4       | Free fluid with dilated bowel loops                                                                                                                                                                                               | Exudative fluid                                                                                                       | Routine blood – normal range                                                    | Empirical antibiotics                                                                                               | -                                        |

Intraoperative findings showed free fluid which was straw colored with dilated bowel loops and mildly inflamed bowel loops. No obvious transition zone or obstruction, stricture was seen. No lymph nodes were identified. The omental and mesenteric tissue biopsy was collected and sent for histopathology and culture.

The HPE was suggestive of chronic inflammation, no necrosis, malignancy. The culture was negative for mycobacterium, or any other microorganism.

All the patients showed steady improvement to the above management and were discharged on soft diet. Repeat follow up at 6 months didn't show any recurrence in Ascites or peritonitis.

## DISCUSSION

The above are case series of ascites developing after routine laparoscopic hysterectomy. Meticulous laboratory investigation failed to identify a definitive causative factor and patients responded to prophylactic antibiotics and empirical steroids.

After excluding life threatening complication of peritonitis due to bowel perforation, bile leak, pancreatitis due to presentation with distension, the patient was put on intravenous fluids and kept nil by mouth. The patients didn't show any signs of fever, tachycardia or other signs of acute abdomen.

Furthermore, routine blood work was not suggestive of any infection with increased total leucocyte count, procalcitonin were within normal range. The ascitic fluid was also negative for any pathological organism. Cytology and atypical microbes were also ruled out.

The histopathological reports showed normal uterus with fibroid, adenomyosis. The gall bladder showed chronic calculous cholecystitis. None of the reports had any atypia or malignancy in the previous surgery. The patients presented as early as a week later to 45 days post-surgery.

Contrast enhanced computed tomography ruled out any hollow viscous injury, bile duct injury, or mesenteric ischemia. Ct of one patient showed adhesions with cocoon abdomen where patient had history of tuberculosis in the past. This patient was taken for diagnostic laparoscopy.

Disinfectants like glutaraldehyde are cost effective, fast acting for instruments which can't be autoclaved. Disposable one-time used instruments would be ideal but expensive to patients.

Hence glutaraldehyde remains one of the most commonly used disinfectants in our scenario.<sup>2</sup> It attaches on the cell surface, and after diffusing intracellularly attacks the proteins. This chemical reaction is irreversible, and there is no known safe antidote. The reported incidence of complications varies from 0.2% to 4.7%.<sup>5</sup>

In order to prevent hazardous effects, the standard of care should be followed. Dismantling, decontamination, precleaning, cleaning and rinsing, drying, sterilization, and storage were the steps followed during the sterilization of laparoscopic instruments in the central sterile supplies department of our hospital. The steps before sterilization with glutaraldehyde can be considered as the preparation procedures of laparoscopic instruments for an appropriate and effective sterilization. During the sterilization step, dismantled, cleaned, and dried laparoscopic instruments are completely immersed into the glutaraldehyde solution, and all of the lumens of submersed instruments are filled with solution. After glutaraldehyde exposure, all laparoscopic instruments are then rinsed thoroughly, and all the channels must be flushed with potable or sterile water at least 3 times. After rinsing, all laparoscopic instruments should be dried with sterile surgical towels before immediate usage or storage.

The toxic effects after minimal access surgery are mostly noticed due to inadequate rinsing and depositions of the disinfectant in the channels. Even small amount of the toxic chemical can lead to ischemic colitis and necrosis with fibrotic changes if it comes in contact with bowel.

After reviewing literature on the above it has been noted that, there are many causes which though are rare but are preventable cause of peritonitis.

There are studies in various age groups regarding the use of glutaraldehyde for cleaning accidental entry in abdominal cavity causing bowel injury.<sup>6</sup> Jonathan et al in their study on pediatric age group mention about its mesentery, bowel and mucosal toxicity. The bowel had to undergo resection and anastomosis.

In a study where proper washing of endoscopes with saline was not done, glutaraldehyde was found in the flushing channels which is reported to cause colitis by Ehem Ahishali et al.<sup>7</sup>

After thorough research and excluding the obvious cause, If no definitive cause for the ascites can be identified, the most likely explanation for the ascites is peritoneal inflammatory reaction to agents used during laparoscopy.<sup>8</sup>

Rarely chemicals used like methylene blue for gynecological procedures has been reported to cause peritonitis.<sup>9</sup> The treatment by maximum studies was bowel rest and empirical antibiotics, rarely any study has been documented for using steroids as a part of treatment.

Chemical peritonitis also called as weeping peritonitis is rare but is an idiopathic inflammatory reaction of peritoneum to commonly used laparoscopic factors like glutaraldehyde used as a disinfectant, carbon dioxide or diathermy.<sup>10</sup> Free fluid in abdomen raises suspicion of hollow viscus or organ injury. Lymphatic or bacterial peritonitis

should also be ruled out. Ascites due to pancreatic injury may also be one of the reasons. In literature it is reported as 0-0.5% due to bowel injury half of them occurring during access into abdomen<sup>1</sup>. Literature also reveals bladder and pancreatic injury leading to Ascites, or usage of antiseptic peritoneal lavage and methylene blue. However, none of the above patients were administered any specific drugs in the peritoneum during previous surgery. The diagnosis of spontaneous bacterial peritonitis was excluded due to no growth of any microorganisms.

The diagnosis of exclusion remains that some rare substances may have triggered the peritonitis and Ascites.<sup>11</sup> After extensive review of literature by Alberto v et al, Jiang went al, it may be possible that the cause of Ascites may be attributed to disinfectant which may not be flushed adequately before using in the abdomen.<sup>11</sup> Use of formalin chamber in previous surgery for sterilizing instruments may be attributable. The research in this field still remains incomplete and case series like above may help avoid the similar complication in future operation.

Wei Jieng et al reported 8 cases of the same in a span of 5 years post laparoscopic gynecological procedures. They were reported to have an allergic reaction to some substance used intra operatively, either a diathermy or glutaraldehyde use.<sup>12</sup> Hakan Nazik et al noticed a similar peritonitis after tubal ligation in 36 year old, as well as the need for resection of bowel in pediatric age group<sup>13</sup>. M H Fischer et al have reported the effect of formaldehyde on various organs, which included intraperitoneal fibro hemorrhagic in nature and known to cause gastritis.<sup>14</sup> The effects of carbon dioxide in causing intrabdominal acidosis and peritoneal inflammation by Umano et al<sup>15</sup>

## CONCLUSION

Formaldehyde is known for its toxic effects in the air and lungs. Its potency for sterilization is also questionable. Especially when potent disinfectant is present, formaldehyde chambers should not be used at all and should be only remembered in history.

Glutaraldehyde is a high-level disinfectant but not effective for Creutzfeldt-Jakob disease, as they cannot act on prions. One must check the compatibility of the instruments, along with have a thorough knowledge of how much concentration is needed with the duration of instruments to be left in the prepared solution. The importance of washing the solution from the equipment can't be stressed enough.

Use of carbon dioxide for creating pneumoperitoneum is well known. The complications of peritonitis have also been documented in literature. It depends on various factors like length of surgery, amount of gas used. Extra efforts to completely take out the gas while reverting the pneumoperitoneum must be taken.

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7. TY - JOUR AU - Ahishali, Emel AU - Uygur-Bayramci, Oya AU - Dolapcioglu, Can AU - Dabak, Resat AU - Mengi, Alperen AU - Isik, Aygun AU - Ermiş, Elvan PY - 2009/12/01 SP - 2541 EP - 5 N2 - Chemical colitis can occur as a result of accidental contamination of endoscopes or by intentional/accidental administration of enemas containing various chemicals. We present three cases of glutaraldehyde induced colitis and review the cases in the literature. Glutaraldehyde induced colitis presents clinically with severe abdominal pain, bloody and mucoid diarrhea, rectal bleeding, and tenesmus 48-72 h after colonoscopy. Endoscopic findings are nonspecific and mimic ischemic colitis, inflammatory bowel disease, and infectious colitis. The timing of symptoms and the knowledge that glutaraldehyde is a chemical irritant to colonic mucosa is important for the diagnosis. The treatment is mainly supportive but sometimes necessitates mesalamine, prednisolone, or metronidazole and the resolution is rapid. In endoscopy units, strict adherence to published disinfection protocols is very important and the cleaning, rinsing and drying protocols also deserve the same attention. T1 - Chemical Colitis Due to Glutaraldehyde: Case Series and Review of the Literature VL - 54 DO - 10.1007/s10620-008-0630-2 JO - Digestive diseases and sciences ER -.
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