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**Ketan Vagholkar**

Professor, Department of Surgery,  
D.Y. Patil University School of  
Medicine Navi Mumbai,  
Maharashtra, India

**Ravindra Kattimani**

Associate Professor, Department of  
Surgery, D.Y. Patil University  
School of Medicine Navi Mumbai,  
Maharashtra, India

**Aniruddha Kale**

Assistant Professor, Department of  
Surgery, D.Y. Patil University  
School of Medicine Navi Mumbai,  
Maharashtra, India

**Shantanu Chandrashekhar**

Resident, Department of Surgery,  
D.Y. Patil University School of  
Medicine Navi Mumbai,  
Maharashtra, India

**Shivangi Garima**

Research Fellow, Department of  
Surgery, D.Y. Patil University  
School of Medicine Navi Mumbai,  
Maharashtra, India

**Yash Kripalani**

Research Fellow, Department of  
Surgery, D.Y. Patil University  
School of Medicine Navi Mumbai,  
Maharashtra, India

**Correspondence**

**Ketan Vagholkar**

Professor, Department of Surgery,  
D.Y. Patil University School of  
Medicine Navi Mumbai,  
Maharashtra, India

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## Hypertonic saline and hydrogen peroxide irrigation therapy for deep seated externally communicating abscess cavities: A novel method

**Ketan Vagholkar, Ravindra Kattimani, Aniruddha Kale, Shantanu Chandrashekhar, Shivangi Garima, Yash Kripalani.**

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### Abstract

Deep seated residual infection following abdominal surgery is a therapeutic challenge. Administering antibiotics based on culture and sensitivity reports may not yield satisfactory results in all cases. Exact anatomical features need to be ascertained by imaging before deciding further course of treatment. Communication with ductal and luminal components of the gastrointestinal tract need to be ruled out before commencing osmotic debridement methodology. A combination of hypertonic saline and hydrogen peroxide irrigation followed by negative suction or vacuum treatment helps in obliteration and healing of deep seated infections. A case of a deep seated abscess cavity communicating with exterior managed by osmotic debridement and vacuum therapy is presented along with a brief review of literature.

**Keywords:** Hypertonic saline hydrogen peroxide vacuum dressing wound care

### Introduction

Managing deep seated abscess cavities continues to be the biggest surgical challenge. Despite the availability of higher antibiotics yet the response to these antibiotics is extremely poor as antibiotic penetration in such locations is also very poor. Therefore mechanical cleansing with a strong irritant solution remains the only option in such cases. A combination of hypertonic saline and hydrogen peroxide has been tried out with rewarding results. A case of a deep seated abscess cavity with a sinus following surgical site infection treated locally with this novel combination of hypertonic saline and hydrogen peroxide is presented.

### Case report

A 49 year old female was referred for specialist opinion for management of a draining sinus at the cranial end of a midline laparotomy scar. The patient has undergone two surgical procedures. A laparoscopic cholecystectomy was performed one year back. Patient was symptom free for a period of seven months when she again presented with an acute attack of pancreatitis. MRCP revealed a residual gall bladder with stones as well as a stone in the common bile duct. An ERCP with endoscopic sphincterotomy, stone removal and biliary stenting was done for relief of obstructive jaundice. She then underwent an open completion cholecystectomy through an upper midline incision. The patient then developed severe surgical site infection. Pus cultures and sensitivity testing revealed klebsiella species resistant to almost all commonly used antibiotics. The patient did not respond to any of the antibiotics with persistent discharge of pus. An MRI sinogram was done to rule out any communication with the pancreatic duct. The pancreatic duct was normal. (Figure 1) However there was an infrahepatic collection anteroinferior to the left lobe of the liver measuring 5.5 x 5.2 x 7.3 cms. The collection was indenting the left lobe of the liver and the distal body and antrum of the stomach. Laterally the collection was extending up to the gall bladder fossa. Inferiorly the collection was tracking down and indenting the transverse colon. Anteriorly the collection was seen tracking through a sinus tract measuring 3.1cms long and 5mm wide opening externally at the cranial end of the midline laparotomy incision. As the response to antibiotics was poor the abscess cavity was irrigated with 3% hydrogen peroxide in 3% hypertonic saline. Irrigation was done till the effluent was clear which took almost thirty minutes. The patient experienced upper abdominal discomfort only at the time of irrigation but

subsequently felt better with no evidence of systemic signs of sepsis. A 14Fr negative suction tube drain was passed into the sinus tract and a continuous negative suction force applied by attaching it to a negative suction apparatus. The patient was asked to empty the bottle at home and measure the daily output. There was a subtle decline in the purulent discharge. The same irrigation process was repeated over weekly intervals. After four sessions within one month a repeat MRI sinogram was done. (Figure 2) This revealed spectacular reduction in the size of the abscess cavity. The cavity was reduced to 3.2 x3.1 x 2.9 cms with the dimensions of the anterior sinus tract now being 2.3 long and 4 mm wide. The volume of the cavity had reduced by almost 90%. There was a further decline in the purulent drainage. The patient underwent two more sessions of irrigation at weekly intervals until the discharge through the sinus completely stopped. Subsequently negative suction drainage was stopped and superficial dressings commenced. Within a period of ten days the sinus opening healed completely. The patient has been following up for the last 8 weeks with no symptoms. (Figure 3).

**Discussion**

Evaluation of the anatomical location of a deep seated abscess cavity is essential before deciding the treatment strategy. Serious consideration needs to be given to detect communication with any ductal or luminal component of the gut as these solutions can cause damage. A double contrast CT scan or an MRI should be done to rule out any communication with ductal or luminal components of the gut. Having ascertained the absence of such an internal communication, can one consider using various solutions for irrigating such deep seated cavities. In the case presented a MRI sinogram was done to rule out communication with the pancreatic duct as the patient had an attack of pancreatitis preceding the operation. After that is done one can make a choice of the solutions which can be used for irrigation. In the case presented the method used for managing a deep seated abscess with an externally communicating sinus involved two solutions and a superimposed negative suction therapy. All three work symbiotically to achieve eradication of infection and stimulate healing. Hydrogen peroxide is one of the traditional wound management agents. It is usually used in the

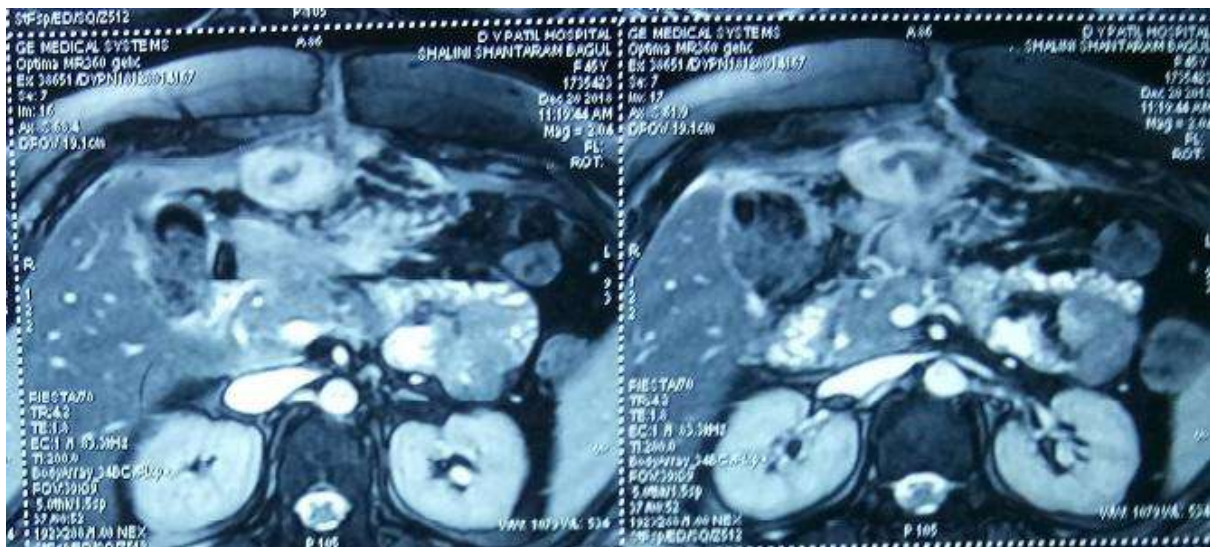
concentration of 3% [1]. In the case presented 3cc of hydrogen peroxide was added to 100 cc of 3% hypertonic saline. This solution was then used for irrigation of the abscess cavity through the sinus. Hydrogen peroxide oxidizes proteins, nucleic acids, lipids and microorganisms [1]. It is a very effective topical antiseptic and kills pathogens through oxidative burst and local oxygen production. It also helps with the production of some molecules with higher oxidative potential and stronger bactericidal ability. It also stimulates angiogenesis [1].

Hypertonic saline acts in a variety of ways [2, 3]. When a large amount of slough is present and obscures the wound bed, the wound is difficult to manage as the healing process is slow. Bacterial proliferation is profuse in such areas [2]. Antibiotics do not penetrate these areas unless debridement is accomplished. Though several methods of debridement such as enzymatic, autolytic, mechanical, biological and osmotic have been described, it is very difficult to choose the right option in deep seated cavities [2, 3]. Hypertonic saline works exceedingly well in such situations by inducing osmotic debridement. Hypertonic saline controls heavily discharging wounds or cavities as in the case presented. It also helps in controlling infection. Majority of bacteria perish in a hyperosmotic environment. Therefore hypertonic saline not only helps in osmotic debridement but also facilitates clearance of infection as well. These effects enhance the biological process of healing. Hypertonic saline also has sclerosing properties which help in obliterating abscess cavities by fibrosis [3].

Negative suction applied to the discharging sinus helps in keeping the cavity free of fluid collection. It also induces collapse of the cavity by creating a vacuum. Negative suction stimulated the process of healing by increasing the blood flow and inducing mechanical stress. This leads to the growth of granulation tissue [4].

A combination of hydrogen peroxide and hypertonic saline for irrigation followed by continuous negative suction therefore works very well in decreasing the discharge, reducing bacterial counts, stimulating granulation tissue and causing collapse and sclerosis of a deep seated cavity as was seen in the case presented.

More such cases need to be treated in a similar manner to estimate the efficacy of this methodology.



**Fig 1:** Contrast enhanced MRI sinogram showing a large cavity communicating externally through a sinus tract.



**Fig 2:** Repeat contrast enhanced MRI sinogram after four sessions of osmotic debridement and vacuum therapy showing significant reduction in the cavity as well as the sinus track.



**Fig 3:** Complete healing with no sinus opening

**Conclusion**

Managing deep seated abscess cavities with discharging sinuses is a challenging surgical problem. Contrast enhanced CT scanning or a MRI is essential for anatomical assessment of the problem. Once the anatomy is ascertained with respect to absence of communication with any ductal or luminal structure in the gastrointestinal tract, then hypertonic saline and hydrogen peroxide irrigation with negative suction therapy is an effective way of managing this septic lesion.

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Consent of patient sought before therapy.

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