

# Laparoscopic Extracorporeal Clot Extrusion Under Local Anesthesia for Removal of Intraluminal Fibrin Clot of Peritoneal Dialysis Catheters

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## Abstract

In this publication, we present our technique with 14 cases for clot removal using a laparoscopic method under local anesthesia that we have called the procedure "extra-corporeal clot extrusion" (ECCE). The result was that laparoscopic "ECCE" should be a considered option for management of catheter malfunction due to fibrin clot.

**Keywords:** Laparoscopic clot extrusion, removal of intraluminal fibrin clot, management of intraluminal fibrin clot.

## INTRODUCTION

The success of peritoneal dialysis depends on the presence of functional long-term catheter access to the peritoneal cavity. Mechanical problems of peritoneal dialysis catheter are the second most common cause of depriving patients from peritoneal dialysis, next to infectious problems.<sup>1</sup> Intraluminal fibrin clot is one type of mechanical problems that mostly treated conservatively by nonsurgical managements like forced flushing of the catheter, push-and - suck maneuver,<sup>2</sup> infusion accelerator,<sup>3</sup> intraperitoneal administration of urokinase<sup>4</sup> or streptokinase,<sup>5,6</sup> instillation of tissue plasminogen activator<sup>7</sup> manipulation by guide-wire<sup>8</sup> or endoscopy brush<sup>9,10</sup> or fogarty catheter.<sup>11</sup> Failure to push out the clot by the above mentioned methods call for surgical intervention.

## SUBJECTS AND METHODS

Between April 2004 and September 2009, fifty laparoscopic procedures for restoring function of malfunctioning peritoneal dialysis catheters were performed. Conservative managements of catheter malfunction failed in all patients. In 15 cases, clot removal was needed. All but 1 case (the first one) we removed the clot, using laparoscopic extracorporeal clot extrusion (ECCE).

## PROCEDURE

All procedures were performed in the operating room with an anesthesiologist in attendance. Under local anesthesia, peritoneal insufflations of N<sub>2</sub>O is established, with pressure

limits set at 8 mm Hg and increased up to 12 mm Hg as needed. Intravenous sedation is used if needed for patient comfort or to relieve fear and anxiety. The procedure involves the placement of 2 or 3 laparoscopic ports. Laparoscopic procedure was initiated by introducing a 5 mm disposable trocar at palmer's point<sup>12</sup> to permit insufflations of gas and insertion of laparoscopic camera. The details of local anesthesia, gas insufflations and first trocar position in all cases were like our technique for laparoscopic implantation of peritoneal dialysis catheter.<sup>13</sup> The laparoscope was used to assist in the placement of a second 5 mm port at a left pararectus area or infraumbilical area depending to the site of previous catheter insertion. In some cases, we inserted an additional 5 mm port at the same side of the second port and with 5 cm distance from it, for releasing adhesions of catheter.

Under laparoscopic vision from the left upper quadrant of abdomen, and after exploration of peritoneal cavity for the cause of malfunction of the catheter, we followed the tip of the catheter and released it from adherent organs if needed by one or two laparoscopic forceps. In the presence of intraluminal fibrin clot, and if it dose not push out by forced flushing, the tip of the catheter was pulled out along with the port device through abdominal wall onto the surface of the abdomen. Out of peritoneal cavity and under direct vision, the clot was extracted often using milking the catheter by hand toward the tip and sometimes it must be push by needle of syringe through holes of the catheter. After complete extraction of the clot, irrigating the catheter and

then returned it to the peritoneal cavity by pushing it back through tissue tract and put it again into the deep pelvis under vision of laparoscopy. Catheter function is tested using a 0.5-L bag of normal saline to demonstrate rapid inflow and out flow. After drainage of insufflated gas, removal of the laparoscopic ports is delayed until a satisfactory irrigation test of the catheter has been achieved. The fascia of the port sites is not ordinarily repaired. Skin wounds are closed with nonabsorbable sutures material. Peritoneal dialysis is generally started at second postoperative day.

## RESULTS

A total of 14 laparoscopic ECCE procedures for clot removal were performed for 14 consecutive patients. The mean patient age was 57.64 years (rang 21 to 75) and male to female ratio was 4:3. All catheters were swan-neck, coiled-tip. Previous implantation procedures in 9 patients were laparoscopic and in 5 patients was open surgery. The procedure was possible in 5 cases by one trocar and other cases need to another additional trocar. In 6 patients, the pathologic problem of the catheter was just intraluminal fibrin clot (IFC). Five patients had intestinal entrapment (IE), 2 patients had adhesion of the catheter to the fallopian tube and 1 patient has tip migration as well as IFC.

In all cases, the clot was successfully extracted using the method described herein. Inflow and outflow of all the catheters was excellent at the end of operation. One patient was dead at day 6 due to sepsis and in another patient the catheter was removed due to nontolerance at day 20. Eight of catheters were nonfunctional before day 20. Long-term function of the catheter was achieved in 4 patients.

## DISCUSSION

In a review of literatures which published from 1999 to 2008, about rescue procedure for malfunctioning peritoneal dialysis catheters, the rate of intraluminal fibrin clot as a cause of mechanical obstruction, was reported between 0 to 60%.<sup>14-18</sup> In our experience according to this study, the rate is 30% (15 from 50).

It is not clearly determined the exact causes of fibrin clot formation in the lumen of the peritoneal dialysis catheter. Peritonitis, intraperitoneal bleeding, visceral entrapment or adhesion to the catheter, delay in the use of the catheter after its implantation and compression of the catheter by adjacent organs are described as predisposing factor of clot

formation.<sup>2,9</sup> Without consideration of the cause of clot formation, clot removal by a safe method, may avoid catheter removal or replacement.

Rapid flushing of the catheter by normal saline mixed with heparin and push-and-suck maneuver often used in attempting to push the intraluminal clot but do not always reliably clear PD catheter of fibrin deposited in the lumen.

Streptokinase is used to clear obstructed catheters by clot from 1969<sup>5</sup> and there is many reports about it,<sup>19,20</sup> but streptokinase is not usable for many patients like those having a predisposition to bleeding, a platelet count less than 100,000/cu mm, prolonged prothrombin or partial thromboplastin times, serious infection around the catheter, known allergy to streptokinase, recent Streptococcal infection, or streptokinase therapy in the previous six months.<sup>21</sup> Urokinase is also effective in clearing clotted catheters.<sup>4</sup> It lacks the risk of allergic reactions that may occur with streptokinase. Manipulation of the catheter using malleable stainless steel wire under fluoroscopic guidance<sup>22</sup> have been reported as a successful procedure which achieved 48 to 65% catheter function success rate, however, this technique required sedation of patients because the stiff wire caused discomfort, and there is potential risk of bowel damage with the stiff wire.

Clot removal using endoscopic channel—cleaning brush under fluoroscopic control is suggested.<sup>9,10</sup> Although, it is smoothly rounded tip would be unlikely to cause trauma to the abdominal contents, but it is a possibility, particularly if the brush was accidentally advanced beyond the end of the catheter into the peritoneal cavity. The other concern is the possibility of dislodgement of bristles of the brush in to the peritoneal cavity. According to our experience for clot removal in our first patient with endoscopy brush, under vision of laparoscopy intracorporeal clot extrusion was very difficult and time wasting.

Laparoscopic clot extrusion has many advantages: It allow direct examination of the catheter and whole peritoneal cavity.

It is highly accurate to confirm the diagnosis of intraluminal fibrin clot as a cause of malfunction of the catheter before using any procedure for rescue it and prevent performance of unnecessary interventions. It enable diagnosis of other accompanying pathology and treatment other surgical problems in the same operations.

Some disadvantages for using laparoscopy in PD catheter implantation or management of malfunctioning catheters

are counted like: the need for general anesthesia, the adverse physiologic effects of CO<sub>2</sub> pneumoperitoneum, the requirement of operating room and experienced surgeon and laparoscopic instruments, and the long duration of the procedure.<sup>18</sup>

The advantages of our laparoscopic technique are: no need to general anesthesia, using N<sub>2</sub>O instead CO<sub>2</sub> that eliminate adverse effect of CO<sub>2</sub> retentions. Our procedure is simple and no need to full laparoscopic experiences or advanced instruments. Feasibility of this procedure under local anesthesia and conscious sedation, provide it as an appropriate method for all patients even for high-risk cases for general anesthesia.

Using laparoscopy for removal of intraluminal fibrin clot is not new.<sup>14-16</sup> In some of the previous reports the clot was extracted intracorporeally by pushing the clot intraluminally using gastroscopic biopsy forceps or urethral catheter,<sup>14,16</sup> or by milking the catheter using atraumatic laparoscopic forceps.<sup>23</sup> In some other reports, extraction of PD catheter through laparoscopic port for rescuing the malfunctioning catheter is suggested. At 1996, Crabtree reported one case of omental wrapping that after mobilization of the catheter, it pulled out, permitting complete removal of the omental and fibrin debris plugging the side holes and lumen of the catheter under direct vision.<sup>24</sup> In review of the literature we could find also some other reports about this technique,<sup>14,25</sup> but all of them are under general anesthesia.

Extraction of the catheter from peritoneal cavity for a short period in a sterile filed could not be rise catheter contamination. Insisting to intracorporeal extrusion of the clot by intraluminal manipulation using different instruments is most likely to raise contamination. Intracorporeal milking of the catheter by laparoscopic forceps is very time wasting and need to additional port site. Pulling out the catheter by open surgery for extraction of the clot or resolving other causes of malfunction that recently reported<sup>18</sup> is not only more invasive but can lead to new adhesion or restriction to continuing the peritoneal dialysis due to more peritoneal trauma.

The number of patients and catheters in this study is too small for meaningful statistical analysis. However, we feel that the laparoscopic "ECCE" should be a considered option for the management of catheter malfunction due to fibrin clot.

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