

# Epidural Catheter Knotting after Epidural Labor Analgesia- A Case Report and Review

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## Abstract

Epidural catheter knotting is a very rare complication for epidural analgesia. We reported a woman with epidural catheter knotting for labor analgesia. The epidural catheter was stuck while removing and concomitant with painful sensation. We failed to pull out the catheter during the initial attempt. After several attempts and changing the patient's position, we removed the catheter successfully and then found the knotting catheter. Literature review suggested too much insertion distance increasing the risks for epidural catheter coiling, bending or twisting and recommend that epidural catheter is better not inserted more than 5cm into the lumbar epidural space. There are also some recommended strategies to remove the catheter. The associated neurological symptoms should also be closely observed when epidural catheter knotting happened.

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## Key Words:

Catheter knotting;  
epidural catheter;  
epidural labor analgesia

## Introduction

Continuous lumbar epidural analgesia with catheter is considered as a safe and effective method for labor pain. [1] However, epidural catheter knotting is a potential complication but extremely rare. The incidence is reported about 0.0015% (1 of 65,140).[2] We reported a case performed with continuous lumbar epidural analgesia for her epidural labor analgesia but found the epidural catheter knotting when the catheter was removed.

## Case Report

A 33-year-old woman presented in our neurosurgery clinic for her unmovable epidural catheter. She was just transferred from local obstetrics clinic where she received labor analgesia with L34 epidural catheter insertion. According to the patient's statement, the delivery process was smooth and epidural labor analgesia was effective. However, the epidural catheter was stuck when removal and she then transferred for help. Her physical condition was healthy and past

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history was unremarkable. Neurosurgeon checked her lumbar spine X-rays but failed to reveal the epidural catheter.[Figure 1] She was then sent to emergency department and the anesthesiologist was consulted for the solution. We checked her epidural dressing condition and there was no bleeding, swelling or other abnormal finding. We then tried to out pull the remaining catheter gently but induced her severe painful sensation over her back. Repeat attempt to remove the catheter was still unsuccessful. Fortunately, after additional attempt combined with her knee-chest posture change, we pulled out the catheter by steady increase the traction force and finally the epidural catheter was removed concomitant with her tolerable painful sensation. The removed catheter was checked and a knot was found. This tight knot was between the 5 to 10cm markers of the catheter. [Figure 2] Mild back pain was still noted after catheter removal but there was no other neurological deficit. She was then discharged due to no other discomfort later.

## ***D***iscussion

According to the previous report, epidural catheter knotting was rare and usually happened for obstetric epidural analgesia/anesthesia at lumbar level.[1] Most of the knot formed within 3 cm from the tip of the epidural catheter. Only 5 of the 18 cases (28%) of the knot was associated an additional loop. The more the catheter was threaded into the epidural space, the greater theoretical potential of knot formation.[3] Although the reason of knotting is probably thought caused by excessive insertion of the epidural catheter, the optimal length of insertion remains controversial. In a study based on roentgenographic analysis suggested that lumbar epidural catheter tended to curl or to double back after the insertion of more than 5 cm.[3] Anesthesiologists should choose the nearest inserting site to provide the

best analgesic level and avoid too deep epidural catheter insertion.

There are some anatomical studies of epidural space assumed that the meningo-vertebral ligaments, also called epidural ligaments, might play a role in the kinked epidural catheter or unsatisfactory epidural analgesia/anesthesia.[4-7] The clinical physicians and surgeons often ignored the segmental fibers between the dura mater and the lumbosacral spinal canal. Blomberg et al. reported the dorsomedian connective tissue band in the lumbar epidural space which was thought as the meningo-vertebral ligaments between dura mater and ligamentum flavum.[4] He assumed that these findings might help explain some accidental dural punctures and the uneven onset or spread during epidural practice. Jiang et al. placed lumbar epidural catheters into 50 adult embalmed cadavers and showed that the epidural space might not be a continuous compartment.[7] It contains fat, lymphatics, vessels, and spinal nerve roots. And the meningo-vertebral ligaments varied from a thin elongated strip to a thick tough sheet. They can form septum and separate the epidural space into different compartments with different sizes and shapes. Among the 50 specimens, 3 catheter tips attached to the meningo-vertebral ligaments and curled into a circle. Knot formation might certainly happen in this situation.

There are some suggestions about management of the trapped epidural catheter and pulling force of this catheter.[8-11] They concluded that the catheter might be removed easier in lateral decubitus position. They also founded that the force required to remove a lumbar extradural catheter in the sitting position was almost twice than that required in the lateral position.[8] The withdrawal force was ranged from 1.2 to 1.7 Newton regardless of the insertion technique or the position at insertion.[9] But some suggest that removal is easiest if the patient is in the same position as while insertion. [10]

Dany et al. proposed an algorithm about the management of the entrapped or broken epidural catheter.[12] They suggested to use continuously steady and gentle traction on the catheter at first attempt. If failed, they then try to put patients in lateral decubitus position with extreme flexion or various degrees of lumbar flexion and extension. CT scan or other image study might be arranged for evaluation if keep failed. Monitoring neurological symptoms during catheter removal is certainly recommended. When radicular symptom or pain occur during removal of the catheter, removal should be stopped. Pulling out the catheter under general anesthesia with neuromuscular blockade can be considered prior to surgical intervention.

We summarized the catheter stuck condition and management as table 1. Epidural catheter Knotting is a rare but do occur condition. Limiting the length of catheter insertion in epidural space reduces the risk. Epidural catheter should not be inserted more than 5 cm into epidural space to avoid catheter knotting. Anesthesiologists should keep in mind that the epidural associated structure such as meningo-vertebral ligaments might cause catheter kinked or unpredictable effect of anesthesia/analgesia. We should remove epidural catheters with gentle and steady traction in various position to avoid tearing and broken. Neurological symptoms should be assessed and monitored before, during and after the removal. Images might be needed for evaluation once catheter trapped and consider general anesthesia with neuromuscular blockade or even surgical intervention.

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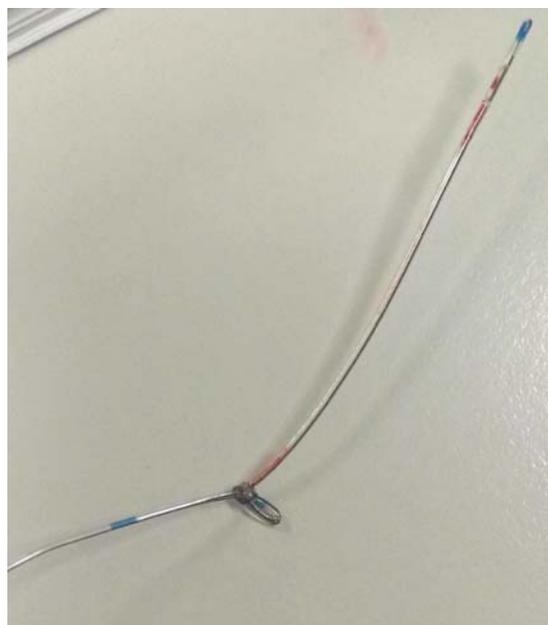
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### Figure Legends

**Figure1.** *The spine X-ray showed radiolucent kinked epidural catheter.*



**Figure2.** *It presents the kinked epidural catheter with a loop knot after removal.*



**Table 1.** *Summary of the risk condition for epidural stuck and management*

The risk condition for epidural stuck and management	
Risk	Too deep epidural catheter insertion (> 5 cm) Meningo-vertebral ligaments variation
Management	Remove in lateral decubitus position Continuously steady and gentle traction on catheter Monitoring neurological symptoms during catheter removal Pull out the catheter under general anesthesia with neuromuscular blockade Surgical intervention

## 減痛分娩硬脊膜外導管置入後打結案例與文獻回顧

何怡懷，劉彥青，董盈秀

在執行減痛分娩技術時，硬脊膜外導管打結是相當罕見的併發症。此篇回顧一位產婦在生產後，硬脊膜外導管打結且難以移除的案例。在一開始拉扯導管時，產婦合併疼痛情形；經過幾次嘗試並變換產婦姿勢，導管終於順利移除。根據文獻回顧，過深或過長的硬脊膜外導管置入，尤其在硬脊膜外腔內長度超過 5 公分的時候，會增加導管纏繞、彎曲或扭轉的風險。在此併發症發生時，可透過目前文獻建議的方式去移除導管，並持續觀察相關神經學症狀。

**關鍵字：**減痛分娩、硬脊膜外導管、導管打結

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