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#### **Diagnosis of Postoperative Urinary Retention Using a Simplified Ultrasound Bladder Measurement**

Daurat, Aurélien MD\*; Choquet, Olivier MD\*; Bringuier, Sophie PharmD, PhD†; Charbit, Jonathan MD\*; Egan, Michael MD\*; Capdevila, Xavier MD, PhD\*

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**背景：**在本研究中，我們試圖確定使用標準超聲設備通過簡化超聲測量膀胱最大的橫徑的方法，是否可以用來診斷術後尿瀰留（POUR）。這個方法可以替代昂貴的膀胱容量測定設備或者複雜的超聲測量步驟（包括測量3條膀胱的直徑）。

**方法：**骨科術後的患者如果不能排空膀胱有術後尿瀦留的風險，在離開蘇醒室之前，對這些患者進行評估。首先使用可攜式超聲設備測量膀胱的直徑(Vscan®; GE Healthcare, Wauwatosa, WI)。隨後自動測定膀胱的容量(Bladderscan® BVI 3000; Diagnostic Ultrasound, Redmond, WA)。最後，插入導尿管後測定實際的尿量。主要結果是使用自動超聲掃描(Bladderscan BVI 3000)或導尿管測定的膀胱容量 $\geq 600$ ml。研究膀胱容量和直徑之間的相關性，並繪製受試者工作曲線來確定預測膀胱容量 $\geq 600$ ml 的表現。由於單個的界值並不總是具有臨床意義，我們使用了“灰色地帶”的方法。

**結果：**研究納入 100 名患者，均進行了膀胱掃描測量。49 名患者獲得了導尿管置入後的尿量。膀胱最大橫徑和通過兩種方法（膀胱掃描及導尿）獲得的尿量之間有顯著的相關性。Pearson 相關係數分別是  $r = 0.80$  (95% 可信區間 [CI], 0.72-0.86;  $P < 0.001$ ) and  $r = 0.79$  (95% CI, 0.65-0.88;  $P < 0.001$ )，膀胱掃描以及導尿預測膀胱容量 $\geq 600$ ml 的 ROC 曲線下面積分別是 0.94 (95% CI, 0.88-0.98) and 0.91 (95% CI, 0.79-0.97)。對於兩種方法，最佳的界值是 9.7 cm。灰色地帶狹窄，從 9.7cm 到 10.7cm，因此限制了無效的測量。

**結論：**簡化超聲測量膀胱最大橫徑的方法似乎可以幫助確定或排除術後尿瀦留 (POUR)。

(杜芳譯 薛張綱校)

**BACKGROUND:** In this study, we sought to determine whether a simplified ultrasound measurement of the largest transverse diameter, using a standard ultrasound machine, could be used to diagnose postoperative urinary retention (POUR). This method may replace expensive bladder volume measuring devices or a more complex ultrasound procedure (involving the measurement of 3 bladder diameters).

**METHODS:** Patients at risk of POUR if unable to void after orthopedic surgery were evaluated in the postanesthesia care unit before discharge. Bladder diameter was first measured using a portable ultrasound device (Vscan®; GE Healthcare, Wauwatosa, WI). An automated evaluation of bladder volume was then performed (Bladderscan® BVI 3000; Diagnostic Ultrasound, Redmond, WA). Finally, when a bladder catheterization was performed, the actual urinary volume was measured. The main outcome was a bladder volume  $\geq 600$  mL as measured using the automated ultrasound scanner (Bladderscan BVI 3000) or by catheterization. Correlations between bladder volumes and diameter were studied and receiver operating characteristic curves were constructed to determine the performance in predicting a bladder volume  $\geq 600$  mL. A "gray zone" approach was developed because a single cutoff value may not always be clinically significant.

**RESULTS:** One hundred patients were included and underwent a Bladderscan measurement. Urinary volume after catheterization was obtained in 49 patients. A significant correlation was found between the largest transverse diameter and urinary volumes assessed by the 2 methods (Bladderscan and catheterization). Pearson correlation coefficients were  $r = 0.80$  (95% confidence interval [CI], 0.72-0.86;  $P < 0.001$ ) and  $r = 0.79$  (95% CI, 0.65-0.88;  $P < 0.001$ ), respectively. The area under the receiver operating characteristic curves for the prediction of a bladder volume  $\geq 600$  mL were 0.94 (95% CI, 0.88-0.98) and 0.91 (95% CI, 0.79-0.97), respectively, for urinary volumes assessed by Bladderscan and catheterization. The optimal cutoff value was 9.7 cm for both methods. The gray zone was narrow, ranging from 9.7 to 10.7 cm thus limiting inconclusive measurements.

**CONCLUSIONS:** A simple ultrasound measurement of the largest transverse bladder diameter seemed to be helpful to exclude or confirm POUR.

在體外培養的人初級羊膜和絨毛膜細胞中孕激素對腫瘤壞死因數  $\alpha$  誘導的基質金屬蛋白酶-9 活性和基因表達的影響

**The Effect of Progestins on Tumor Necrosis Factor  $\alpha$ -Induced Matrix Metalloproteinase-9 Activity and Gene Expression in Human Primary Amnion and Chorion Cells In Vitro**

Allen, Terrence K. MBBS, FRCA\*; Feng, Liping MD†; Nazzari, Matthew BS\*; Grotegut, Chad A. MD, MHS†; Buhimschi, Irina A. MD‡§; Murtha, Amy P. MD†

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**背景：**目前用於防止早產兒胎膜早破的治療方式非常有限，但孕激素可能會起到一定作用。腫瘤壞死因數  $\alpha$  (TNF $\alpha$ ) 可以增強胎膜內基質金屬蛋白酶 9 (MMP-9) 基因的表達和活性，從而導致胎膜弱化和破裂。曾有研究表明，在細胞滋養層細胞系中孕激素可以減弱 TNF $\alpha$  誘導的 MMP-9 活性。然而，在胎膜初級羊膜絨毛膜細胞中是否存在相似的作用是未知的。在這項研究中，我們從足月剖宮產患者的胎膜中採集初級絨毛膜和羊膜細胞，評估了孕激素對基礎水準和 TNF $\alpha$  誘導的 MMP-9 活性和基因表達的作用。

**方法：**我們從足月剖宮產患者 (N = 11) 胎膜中分離提取初級羊膜和絨毛膜細胞。初級羊膜和絨毛膜細胞混合培養液分別給予濃度為 10 $\mu$ M 的載體 (對照)、孕酮 (P4)、17 $\alpha$ -己酸孕酮 (17P) 或醋酸甲孕酮 (MPA) 預處理 6 小時，隨後給予 10ng/ml TNF $\alpha$  刺激 24 小時。對照組按照是否使用 TNF $\alpha$  刺激分為未刺激對照組與刺激對照組。兩個對照組量化值均為 100 個單位。然後我們使用明膠酶譜的方法來定量細胞培養基中 MMP-9 的酶活性，並提取總 RNA，使用即時定量 PCR 來定量 MMP-9 的基因表達。基礎水準的 MMP-9 活性和基因表達水準作為標準化未刺激對照。TNF $\alpha$  刺激的 MMP-9 的活性和基因表達水準作為標準化的刺激對照。本研究主要結果是在體外初級羊膜和絨毛膜細胞中孕激素對 TNF $\alpha$  誘導 MMP-9 酶活性的影響。次要結果包括在體外初級羊膜和絨毛膜細胞中孕激素治療對 TNF $\alpha$  誘導的 MMP-9 基因的表達和基礎水準 MMP-9 的活性和基因表達的影響。

**結果：**本研究中代細胞是從 11 例患者胎膜中提取的。與未刺激的對照相比，TNF $\alpha$  可增加 MMP-9 的活性 (初級羊膜細胞 P = 0.005，絨毛膜細胞 P <0.001) 和 MMP-9 的基因表達 (初級羊膜細胞 P = 0.030，絨毛膜細胞 P <0.001)。與未刺激的對照相比，MPA 可以減少基礎水準 MMP-9 活性 [平均差 (95%CI) -49.6 (-81.9, -17.3)，P = 0.001] 和基因表達 [平均差 (在初級羊膜細胞 95%CI) -53.4 (-105.9, -0.9)，P = 0.045]，但 P4 或 17P 沒有這種作用。與刺激對照相比，MPA 也可以降低初級羊膜細胞 TNF $\alpha$  誘導的 MMP-9 的活性 [平均差 (95%CI) -69.0 (-91.8, -46.3)，P <0.001] 和基因表達 [平均差 (95%CI) -86.0 (-120.7, -51.3)，P <0.001]。孕激素預處理對絨毛膜細胞基礎水準或 TNF $\alpha$  誘導的 MMP-9 活性和基因表達無顯著影響。

**結論：**初級羊膜細胞中 MPA 對基礎水準和 TNF $\alpha$  誘導的 MMP-9 活性和基因表達有抑制作用，闡明了孕激素可以防止胎膜薄弱導致的胎膜早破的可能機制。

(江凌慧 譯 薛張綱 校)

**BACKGROUND:** Current treatment modalities for preventing preterm premature rupture of membranes are limited, but progestins may play a role. Tumor necrosis factor  $\alpha$  (TNF $\alpha$ ) enhances matrix metalloproteinase-9 (MMP-9) gene expression and activity in fetal membranes, contributing to membrane weakening and rupture. We previously demonstrated that progestins attenuate TNF $\alpha$ -induced MMP-9 activity in a cytotrophoblast cell line. However, whether they have a similar effect in primary amnion and chorion cells of fetal membranes is unknown. In this study, we evaluated the effect of progestins on basal and TNF $\alpha$ -induced MMP-9 activity and gene expression in primary chorion and amnion cells harvested from the fetal membranes of term nonlaboring patients.

**METHODS:** Primary amnion and chorion cells were isolated from fetal membranes obtained from term uncomplicated nonlaboring patients following elective cesarean delivery (n = 11). Confluent primary amnion and chorion cell cultures were both pretreated with vehicle (control), progesterone (P4), 17 $\alpha$ -hydroxyprogesterone caproate (17P), or medroxyprogesterone acetate (MPA) at 10 M concentration for 6 hours followed by stimulation with TNF $\alpha$  at 10 ng/mL for an additional 24 hours. Cell cultures pretreated with the vehicle only served as the unstimulated control and the vehicle stimulated with TNF $\alpha$  served as the stimulated control. Both controls

were assigned a value of 100 units. Cell culture medium was harvested for MMP-9 enzymatic activity quantification using gelatin zymography. Total RNA was extracted for quantifying MMP-9 gene expression using real-time quantitative PCR. Basal MMP-9 activity and gene expression data were normalized to the unstimulated control. TNF $\alpha$ -stimulated MMP-9 activity and gene expression were normalized to the stimulated control. The primary outcome was the effect of progestins on TNF $\alpha$ -induced MMP-9 enzymatic activity in term human primary amnion and chorion cells in vitro. Secondary outcomes included the effect of progestin therapy on TNF $\alpha$ -induced MMP-9 gene expression and on basal MMP-9 activity and gene expression in primary amnion and chorion cells in vitro.

**RESULTS:** Primary cells were harvested from 11 patients. Compared with the unstimulated control, TNF $\alpha$  increased MMP-9 activity (P = 0.005 versus control in primary amnion cells and P < 0.001 versus control in primary chorion cells) and MMP-9 gene expression (P = 0.030 versus control in primary amnion cells, P < 0.001 versus control in primary chorion cells). Compared with the unstimulated controls, MPA, but not P4 or 17P, reduced basal MMP-9 activity [mean difference (95% CI) -49.6 (-81.9, -17.3) units, P = 0.001] and gene expression [mean difference (95% CI) -53.4 (-105.9, -0.9) units, P = 0.045] in primary amnion cells. Compared with the stimulated control, MPA also reduced TNF $\alpha$ -induced MMP-9 activity [mean difference (95% CI) -69.0 (-91.8, -46.3) units, P < 0.001] and gene expression [mean difference (95% CI) -86.0 (-120.7, -51.3) units, P < 0.001] in primary amnion cells. Progestin pretreatment had no significant effect on basal or TNF $\alpha$ -induced MMP-9 activity and gene expression in primary chorion cells.

**CONCLUSIONS:** The inhibitory effect of MPA on both basal and TNF $\alpha$ -induced MMP-9 activity and gene expression in primary amnion cells demonstrate a possible mechanism by which progestins may prevent fetal membrane weakening leading to preterm premature rupture of membranes.

## 關於單次肌間溝注射阻滯實質優勢的系統回顧性 meta-分析

### Will the Real Benefits of Single-Shot Interscalene Block Please Stand Up? A Systematic Review and Meta-Analysis

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**背景：**肌間溝阻滯可以提供肩部手術的術後鎮痛，但目前仍缺乏描述其鎮痛好處的可靠量化評估。本 meta-分析調查了單次肌間溝注射阻滯在肩部手術術後第一個 48 小時內的鎮痛作用。

**方法：**我們回顧了比較了使用肌間溝阻滯和無肌間溝阻滯的鎮痛的肩部手術的隨機對照和類隨機對照試驗。利用視覺類比評分評估術後 24 小時靜息痛的程度（10cm 長度，0 代表完全無痛，10 代表最嚴重疼痛），並將其作為主要結局。次要結局包括術後 2,4,6,8,12,16,32,36,40 及 48 小時的靜息痛和活動痛的疼痛程度。阿片類藥物用量，術後噁心嘔吐的嚴重程度，病人對術後鎮痛的滿意程度以及 PACU 時間和住院時間也將列入評估範疇。

**結果：**本研究共分析了 23 個隨機對照試驗，包括 1090 位病人。與非肌間溝阻滯組相比，術後 24 小時內，肌間溝阻滯組具有更嚴重的靜息痛，加權平均差為 0.96cm（95%的置信區間為 0.08-1.83；P=0.03），但是超過 24 小時，二者疼痛程度無差別。肌間溝阻滯組中，靜息痛和運動痛的鎮痛時間分別為 8 小時和 6 小時，相對應的靜息痛評估的加權平均差為 -1.59cm（95%的可信區間為 -2.60—-0.58cm），運動痛評估的加權平均差為 -2.20cm（-4.34—-0.06cm），且超過這兩個時間點後疼痛無進一步緩解。肌間溝阻滯減少術後 12



小時內阿片類藥物用量，減少術後 24 小時內噁心嘔吐的發生以及減少術後 PACU 時間和住院時間。區域阻滯的類型、藥物劑量及注射容量並不影響研究結果。

**結論：**肌間溝阻滯能夠提供有效的術後鎮痛，包括術後 6 小時內的運動痛和 8 小時內的靜息痛，而此後無顯著優勢。接受肌間溝阻滯的病人會在術後 24 小時內感受到反跳痛，但是 24 小時後和未接受肌間溝阻滯的病人的疼痛體驗無明顯差別。肌間溝阻滯可分別在術後 12 小時和 24 小時內減少阿片類藥物用量和阿片類藥物相關的副作用。這些研究結果有助於肩部手術實施肌間溝阻滯的術前風險討論。

(潘豔譯 薛張綱校)

**BACKGROUND:** Interscalene block (ISB) can provide pain relief after shoulder surgery, but a reliable quantification of its analgesic benefits is lacking. This meta-analysis examines the effect of single-shot ISB on analgesic outcomes during the first 48 hours after shoulder surgery.

**METHODS:** We retrieved randomized and quasirandomized controlled trials examining the analgesic benefits of ISB compared with none in shoulder surgery. Severity of postoperative pain measured on a visual analog scale (10 cm scale, 0 = no pain, 10 = worst pain) at rest at 24 hours was the designated primary outcome. Secondary outcomes included pain severity at rest and with motion at 2, 4, 6, 8, 12, 16, 32, 36, 40, and 48 hours postoperatively. Opioid consumption, postoperative nausea and vomiting, patient satisfaction with pain relief, and postanesthesia care unit and hospital discharge time were also assessed.

**RESULTS:** A total of 23 randomized controlled trials, including 1090 patients, were analyzed. Patients in the ISB group had more severe postoperative pain at rest by a weighed mean difference (95% confidence interval) of 0.96 cm (0.08–1.83;  $P = 0.03$ ) at 24 hours compared with no ISB, but there was no difference in pain severity beyond that point. The duration of pain relief at rest and with motion after ISB were 8 and 6 hours, respectively, with a corresponding weighed mean difference in visual analog scale pain scores (99% confidence interval) of  $-1.59$  cm ( $-2.60$  to  $-0.58$ ) and  $-2.20$  cm ( $-4.34$  to  $-0.06$ ), respectively, with no additional pain relief benefits beyond these points. ISB reduced postoperative opioid consumption up to 12 hours, decreased postoperative nausea and vomiting at 24 hours, and expedited postanesthesia care unit and hospital discharge. The type, dose, and volume of local anesthetic used did not affect the results.

**CONCLUSIONS:** ISB can provide effective analgesia up to 6 hours with motion and 8 hours at rest after shoulder surgery, with no demonstrable benefits thereafter. Patients who receive an ISB can suffer rebound pain at 24 hours but later experience similar pain severity compared with those who do not receive an ISB. ISB can also provide an opioid-sparing effect and reduce opioid-related side effects in the first 12 and 24 hours postoperatively, respectively. These findings are useful to inform preoperative risk-benefit discussions regarding ISB for shoulder surgery.

## 持續氣道正壓對阻塞性睡眠呼吸暫停患者接受手術治療術後結果的影響：系統性回顧和 Meta-分析

### The Effects of Continuous Positive Airway Pressure on Postoperative Outcomes in Obstructive Sleep Apnea Patients Undergoing Surgery: A Systematic Review and Meta-Analysis

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**背景：**阻塞性睡眠呼吸暫停（OSA）是接受手術治療患者的一個常見的合併症，並且是術後不良事件發生的一個很大的危險因素。在這篇文章中我們的目標是調查持續正壓通氣（CPAP）在減少接受手術治療的 OSA 患者術後不良事件發生的危險因素的效果，圍手術期呼吸紊亂的指數（AHI）以及住院時間（LOS）。

**方法：**我們對文獻資料庫進行了一個系統調查。我們回顧這個研究包括以下部分：（1）確診 OSA 的成人手術患者（>18 歲）；（2）無論是採用術前和/或術後 CPAP 或無 CPAP 的患者；（3）可獲得術後不良事件，術前或術後 AHI 以及 LOS 的報告；（4）所有用英文發表的研究，包括病例。

**結果：**包括 904 位病人的 6 項研究可用來做 meta-分析。我們用 904 位患者做了關於術後不良事件的 meta-分析（CPAP: n = 471 vs no-CPAP: n = 433; 不良事件: 134 vs 133; P = 0.19）。這 2 組間術後不良事件的發生率沒有明顯差異。沒有 CPAP 患者的術前基線 AHI 相對於使用 CPAP 患者顯著下降（術前 AHI vs 術後 AHI,  $37 \pm 19$  vs  $12 \pm 16$  個事件每小時,  $P < 0.001$ ）。

**結論：**我們的研究表明在有 CPAP 和無 CPAP 治療的患者術後不良事件的發生率沒有明顯差異。使用 CPAP 的患者有一個明顯的更低的術後 AHI 和更短的 LOS。這可能是圍手術期使用 CPAP 的一個潛在優勢。

（張秋麗 譯，李士通 審校）

**BACKGROUND:** Obstructive sleep apnea (OSA) is a commonly encountered comorbid condition in patients undergoing surgery and is associated with a greater risk of postoperative adverse events. Our objective in this review was to investigate the effectiveness of continuous positive airway pressure (CPAP) in reducing the risk of postoperative adverse events in patients with OSA undergoing surgery, the perioperative Apnea-Hypopnea Index (AHI), and the hospital length of stay (LOS).

**METHODS:** We performed a systematic search of the literature databases. We reviewed the studies that included the following: (1) adult surgical patients (>18 years old) with information available on OSA; (2) patients using either preoperative and/or postoperative CPAP or no-CPAP; (3) available reports on postoperative adverse events, preoperative and postoperative AHI, and LOS; and (4) all published studies in English including case series.

**RESULTS:** Six studies that included 904 patients were eligible for the meta-analysis. The meta-analysis for postoperative adverse events was performed in 904 patients (CPAP: n = 471 vs no-CPAP: n = 433; adverse events: 134 vs 133; P = 0.19). There was no significant difference in the postoperative adverse events between the 2 groups. The preoperative baseline AHI without CPAP was reduced significantly with postoperative use of CPAP (preoperative AHI versus postoperative AHI,  $37 \pm 19$  vs  $12 \pm 16$  events per hour,  $P < 0.001$ ). LOS showed a trend toward significance in the CPAP group versus the no-CPAP group ( $4.0 \pm 4$  vs  $4.4 \pm 8$  days,  $P = 0.05$ ).

### CONCLUSIONS:

Our review suggests that there was no significant difference in the postoperative adverse events between CPAP and no-CPAP treatment. Patients using CPAP had significantly lower postoperative AHI and a trend toward shorter LOS. There may be potential benefits in the use of CPAP during the perioperative period.

### 美國麻醉重症監護訓練者的重症監護基礎超聲學習目標：專家小組的意見

#### Critical Care Basic Ultrasound Learning Goals for American Anesthesiology Critical Care Trainees: Recommendations from an Expert Group

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目的在這篇文章中，我們定義學習目標並推薦有關重症監護專家的基本重症監護超聲（CCUS）的能力。

設計敘事審查，並包含在本文的建議是，由重症監護麻醉醫師學會主辦。我們的建議是由麻醉科和重症心臟病與超聲正規培訓的專家小組基於結構化的文獻綜述。鑒定並考慮麻醉重症護理等專業的學習和訓練程式的發佈說明。部分是由專門小組撰寫，不同意的也列入正文。

結果學習的目的和目標，是爲了獲得專科水準的使用 CCUS 的能力（重症監護獎學金培訓），這個能力可以使我們在重症監護環境診斷和監測的重要器官功能障礙。超聲檢查分爲血管、腹部、胸部和心臟部分。對於每個部分都有一個學習目標和特殊技能，並會描述教學建議和學習方法。

討論超聲資源的及時床邊可用性極大地提高了重症監護醫師照顧危重病病人的能力。麻醉-危重病醫學培訓需要有麻醉科解釋基礎 CCUS 的明確的期望和業績標準—重症監護專家。這篇文章的學習目標反應了目前多專科重症監護環境的趨勢，即以超聲爲基礎的診斷策略已被頻繁應用。這些能力需要作爲既定的麻醉-重症監護醫學研究醫學教育專案的一部分被傳授。

（張秋麗 譯，李士通 審校）

#### **OBJECTIVE:**

In this review, we define learning goals and recommend competencies concerning focused basic critical care ultrasound (CCUS) for critical care specialists in training.

#### **DESIGN:**

The narrative review is, and the recommendations contained herein are, sponsored by the Society of Critical Care Anesthesiologists. Our recommendations are based on a structured literature review by an expert panel of anesthesiology intensivists and cardiologists with formal training in ultrasound. Published descriptions of learning and training routines from anesthesia-critical care and other specialties were identified and considered. Sections were written by groups with special expertise, with dissent included in the text.

**RESULTS** Learning goals and objectives were identified for achieving competence in the use of CCUS at a specialist level (critical care fellowship training) for diagnosis and monitoring of vital organ dysfunction in the critical care environment. The ultrasound examination was divided into vascular, abdominal, thoracic, and cardiac components. For each component, learning goals and specific skills were presented. Suggestions for teaching and training methods were described.

**DISCUSSION** Immediate bedside availability of ultrasound resources can dramatically improve the ability of critical care physicians to care for critically ill patients. Anesthesia--critical care medicine training should have definitive expectations and performance standards for basic CCUS interpretation by anesthesiology--critical care specialists. The learning goals in this review reflect current trends in the multispecialty critical care environment where ultrasound-based diagnostic strategies are already frequently applied. These competencies should be formally taught as part of an established anesthesiology-critical care medicine graduate medical education programs.

#### **關於夜班呼叫系統對非目的性硬膜穿刺發生率影響的回顧性研究**

**The Influence of a Night-Float Call System on the Incidence of Unintentional Dural Puncture: A Retrospective Impact Study**

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**背景** 住院醫生的夜班制度已經引起了不良的後果。現在我們假設住院醫生夜班做產科麻醉會增加非目的性硬膜穿刺的發生率。

**方法** 我們回顧性的比較 7 月至 12 月間在非夜班期間（對照組）及夜班期間（實驗組）非目的性硬膜穿刺的發生率。我們將對穿刺傷發生在一周的周幾及麻醉醫生的工作水準進行評估。

**結果** 非目的性硬膜穿刺在對照組中的發生率為 0.73% (20 of 2758)，而實驗組的發生率為 1.49% (39 of 2612) (P=0.08；相對危險度=2.06；95%置信區間=1.23—3.74)。由於急診麻醉引起非目的性硬膜穿刺的比例-1，住院醫生在實驗組及對照組中的比例分別為 28.2% (11 of 39) 和 5.0% (1 of 20) (相關危險度=5.64；95%置信區間=1.07-152；；P = 0.044)

**結論** 實行夜班呼叫制度會增加非目的性硬膜穿刺的發生率。

(徐典譯，李士通 審校)

**BACKGROUND:** Resident night-float systems have been associated with adverse outcomes. We hypothesized that an obstetric anesthesia night float would increase the incidence of unintentional dural punctures.

**METHODS:** The July to December incidence of unintentional dural puncture before (control group) and with night float (night-float group) was compared retrospectively. The incidence of unintentional dural puncture by day of week and trainee level was evaluated.

**RESULTS:** The unintentional dural puncture rate of control group was 0.73% (20 of 2758) vs 1.49% (39 of 2612) in the night-float group (P = 0.008; relative risk = 2.06; 95% confidence interval = 1.23-3.74). The proportion of unintentional dural punctures attributed to clinical anesthesia-1 residents in the night-float and control groups was 28.2% (11 of 39) and 5.0% (1 of 20), respectively (relative risk = 5.64; 95% confidence interval = 1.07-152; P = 0.044).

**CONCLUSIONS:** Implementation of night float increased the incidence of unintentional dural puncture.

**關於不同濃度美托咪啉在成年老鼠海馬組織切片中對基底興奮性突觸傳遞和突觸塑形作用的研究**

**The Effects of Different Concentrations of the  $\alpha$ 2-Adrenoceptor Agonist Medetomidine on Basal Excitatory Synaptic Transmission and Synaptic Plasticity in Hippocampal Slices of Adult Mice**

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**背景**  $\alpha$ 2 受體激動劑作為鎮靜或止痛藥被頻繁的應用於人類和動物的麻醉中。然而， $\alpha$ 2 受體激動劑會損傷認知功能。人們對不同濃度  $\alpha$ 2 受體激動劑作用於學習及記憶的神經生理學基礎--突觸塑形的影響所知甚少。因此，我們研究了不同濃度的美托咪啉 ( $\alpha$ 2 受體激動劑) 對基底興奮性突觸傳遞及突觸塑形兩種形式---雙脈衝異化 (PPF) 和長時程增強 (LTP) 的影響。

**方法** 在老鼠海馬切片的謝弗纖維 CA1 錐形細胞突觸上記錄誘發的節段興奮性突觸後電位，測量其最初興奮性突觸後電位的斜率。將逐漸增高濃度的美托咪定(1-200  $\mu\text{M}$ )應用於每一個切片上，記錄其基底興奮性突觸傳遞和雙脈衝易化的突觸塑形。測試濃度的美托咪啉 (0.1-0.4  $\mu\text{M}$ )應用於額外的切片中，記錄其 LTP 的誘導及維持。

**結果** 低濃度的測試美托咪定在降低 LTP 的作用中呈濃度依賴關係，而若要降低纖維凌空振幅及基底興奮性突觸傳遞則需要更大的藥物濃度。PPF 只能被高濃度(200  $\mu\text{M}$ )的藥物影響。

**結論** 美托咪啉降低老鼠海馬組織的長時程增強突觸塑形與藥物誘導記憶缺失的能力有關。

(徐典譯，李士通 審校)

**BACKGROUND:**  $\alpha$ 2-Adrenoceptor agonists are used frequently in human and veterinary anesthesia as sedative/analgesic drugs. However, they can impair cognition. Little is known about the concentration-dependent effects of  $\alpha$ 2-adrenoceptor agonists on synaptic plasticity, the neurophysiological basis of learning and memory. Therefore, we investigated the effects of different concentrations of medetomidine, an  $\alpha$ 2-adrenoceptor agonist, on basal excitatory synaptic transmission and on 2 forms of synaptic plasticity: paired-pulse facilitation (PPF) and long-term potentiation (LTP).

**METHODS:** Evoked field excitatory postsynaptic potentials were recorded in Schaffer fibers-CA1 pyramidal cell synapses of mouse hippocampal slices, and the initial field excitatory postsynaptic potentials slope was measured. For basal synaptic transmission and PPF, increasing concentrations of medetomidine (1-200  $\mu\text{M}$ ) were applied to each slice. For LTP experiments, individual slices were used for each tested concentration of medetomidine (0.1-0.4  $\mu\text{M}$ ), where LTP induction and LTP maintenance were measured.

**RESULTS:** The lower tested concentrations of medetomidine decreased LTP in a concentration-dependent manner, whereas greater concentrations were required to decrease fiber volley amplitude and basal excitatory synaptic transmission. PPF was only affected by the greatest concentration (200  $\mu\text{M}$ ).

**CONCLUSIONS:** Medetomidine decreased LTP in the mouse hippocampus, in accordance with the ability of medetomidine to induce memory deficits

**阿法沙龍新型製劑：一種以磺丁基醚- $\beta$ -環糊精為輔料的水溶性靜脈麻醉藥**

**Alphaxalone Reformulated: A Water-Soluble Intravenous Anesthetic Preparation in Sulfobutyl-Ether- $\beta$ -Cyclodextrin**

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**背景：**阿法沙龍是一種不溶于水的神經活性類固醇類麻醉藥。它於 1972 年上市，商品名為安泰酮®，它使用一種名為聚氧乙烯蓖麻油 EL 的非離子型表面活性劑作為輔料。它自 1972 年至 1984 年在許多國家作為一種多用途短效靜脈麻醉藥使用於臨床。但由於聚氧乙烯蓖麻油 EL 的致敏性，它退出了臨床使用。在本項研究中，研究者比較了三種麻醉藥的性能：一種溶于磺丁基醚- $\beta$ -環糊精 (SBECD，一種水溶性分子，其內部有一個脂溶性空腔使藥物能溶解於水) 的新型阿法沙龍水溶液，以聚氧乙烯蓖麻油 EL 為輔料的阿法沙龍和丙泊酚製劑。

**方法：**兩種阿法沙龍溶液 (10mg/ml) 如下配置：一種使用加入 13% w/v SBECD 溶液的生理鹽水 (PHAX)，另一種如文獻中描述的使用 20% 聚氧乙烯蓖麻油 EL (ALTH)。溶

於 10% v/v 大豆油乳膠的丙泊酚 (10mg/ml; PROP) 作為對比麻醉藥。雄性 Wistar 小鼠 (180-220g) 在氟烷麻醉下行頸靜脈置管。每組各 10 只小鼠通過靜脈分別給予從 1.2mg/kg 至致死劑量的 PHAX, ALTH 或 PROP。每種藥物產生麻醉效果的劑量 (翻正反射和招尾反應消失) 和小鼠的 50% 致死量由概率分析得出。同時比較了每種藥物對動脈血壓和心率的影響。

**結果:** 靜脈注射 PHAX, ALTH 和 PROP 可產生劑量依賴的鎮靜和麻醉效果, 各藥物的翻正反射消失的半數有效劑量 (ED50) 分別為 2.8, 3.0 和 4.6mg/kg。PROP 致 10 只小鼠全部死亡的劑量大於 30 mg/kg (半數致死劑量 (LD50) = 27.7 mg/kg)。ALTH 致 10 只小鼠全部死亡的阿法沙龍劑量為 53mg/kg (LD50 = 43.6mg/kg)。然而當給予相同劑量溶于 SBECD 的阿法沙龍, 卻沒有小鼠死亡。PHAX 在 84mg/kg 的最大測試量時發生 20% 死亡。PHAX 比 PROP 產生更少的心血管抑制。使用這三種藥物的載體進行的對照實驗沒有表現出任何反應。

**結論:** 阿法沙龍的兩種劑型 (PHAX 和 ALTH) 在相同劑量下都迅速產生了麻醉效果。使用 SBECD 作為藥物助溶輔料並沒有改變阿法沙龍的麻醉效果, 但提高了其治療指數。PHAX 比丙泊酚脂劑和阿法沙龍的聚氧乙烯蓖麻油 EL 劑型擁有更大的安全邊際。

(張帆譯 陳傑校)

**BACKGROUND:** Alphaxalone is a neuroactive steroid anesthetic that is poorly water soluble. It was formulated in 1972 as Althesin® using Cremophor® EL, a nonionic surfactant additive. The product was a versatile short-acting IV anesthetic used in clinical practice in many countries from 1972 to 1984. It was withdrawn from clinical practice because of hypersensitivity to Cremophor EL. In the investigations reported here, we compared the properties of 3 anesthetics: a new aqueous solution of alphaxalone dissolved in 7-sulfobutyl-ether- $\beta$ -cyclodextrin (SBECD, a water-soluble molecule with a lipophilic cavity that enables drug solubilization in water); a Cremophor EL preparation of alphaxalone; and propofol.

**METHODS:** Two solutions of alphaxalone (10 mg/mL) were prepared: one using 13% w/v solution of SBECD in 0.9% saline (PHAX) and the other a solution of alphaxalone prepared as described in the literature using 20% Cremophor EL (ALTH). A solution of propofol (10 mg/

mL; PROP) in 10% v/v soya bean oil emulsion was used as a comparator anesthetic. Jugular IV catheters were implanted in male Wistar rats (180–220 g) under halothane anesthesia. Separate groups of 10 implanted rats each were given IV injections of PHAX, ALTH, or PROP from 1.2 mg/kg to lethal doses. Doses of each drug that caused anesthesia (loss of righting reflex and response to tail pinch) and lethality in 50% of rats were calculated by probit analysis. The drugs were also compared for effects on arterial blood pressure and heart rate.

**RESULTS:** IV PHAX, ALTH, and PROP caused dose-related sedation and anesthesia, with 50% effective dose (ED50) values for loss of righting reflex being 2.8, 3.0, and 4.6 mg/kg, respectively. PROP led to death in 10 of 10 rats at doses >30 mg/kg (50% lethal dose (LD50) = 27.7 mg/kg). A dose of alphaxalone 53 mg/kg as ALTH caused 10 of 10 rats to die (LD50 = 43.6 mg/kg), whereas none died when given the same doses of alphaxalone formulated in SBECD. PHAX caused 20% lethality at the maximal dose tested of 84 mg/kg. PHAX caused less cardiovascular depression than PROP. Control experiments with the 3 drug-free vehicles showed no effects.

**CONCLUSIONS:** Alphaxalone caused fast-onset anesthesia at the same dose for both formulations (PHAX and ALTH). The use of SBECD as a drug-solubilizing excipient did not alter the anesthetic effect of alphaxalone, but it did increase the therapeutic index of alphaxalone in PHAX compared with ALTH. PHAX has a higher safety margin than the propofol lipid formulation and also the alphaxalone formulation in Cremophor EL (ALTH).

關於縮宮素、麥角新碱、卡前列素及上述混合藥物對於人子宮肌層收縮影響的一項體外研究

## The Contractile Effects of Oxytocin, Ergonovine, and Carboprost and Their Combinations: An In Vitro Study on Human Myometrial Strips

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**背景：**該研究目的是在體外實驗中比較縮宮素（低劑量與高劑量）與麥角新碱或卡前列素聯合應用對剖宮產（CD）產婦子宮肌層收縮的影響，以及給予縮宮素預處理後對於上述各組子宮肌層收縮的影響。假設縮宮素聯合應用麥角新碱或卡前列素與單獨應用縮宮素相比可改善子宮肌層的收縮性。

**方法：**子宮肌層的樣本來自於擇期行剖宮產手術的女性。將上述樣本置於器官浴室，實驗組給予縮宮素 10-5M，對照組給予生理鹽水，各預處理 2 小時。2 小時後將樣本洗淨後進行單獨給予縮宮素、麥角新碱或卡前列素（10-10~10-5M）或聯合應用固定低劑量（10-10M）（LDOx）或高劑量（10-6M）（HDOx）縮宮素的劑量反應實驗。利用線性回歸模型分析並比較劑量反應實驗中的收縮幅度、頻率、曲線下面積以及動力指數（振幅\*頻率），主要結果是比較各組的動力指數。

**結果：**對來自 56 名女性的樣本進行 169 次實驗。其中對照組縮宮素的動力指數均方根（標準誤）(3.40 [0.24])顯著高於實驗組(2.02 [0.15]) ( $P < 0.001$ )。比較所有對照組，縮宮素組的動力指數(3.21 [0.25])顯著高於麥角新碱組(2.13 [0.30],  $P < 0.001$ [多重比較校正  $P$  值,  $P < 0.001$ )、卡前列素組(1.88 [0.10],  $P < 0.001$  [ $P < 0.001$ ])、麥角新碱+ LDOx 組(2.07 [0.15],  $P < 0.001$  [ $P < 0.001$ ])及卡前列素+ LDOx (1.82 [0.15],  $P < 0.001$  [ $P < 0.001$ ])，而前者與麥角新碱+ HDOx 組(3.39 [0.32],  $P = 0.68$  [ $P = 0.99$ ])、卡前列素+ HDOx 組 (3.39 [0.32],  $P = 0.68$  [ $P = 0.99$ ])則無顯著差異。然而對於縮宮素預處理的各組，卡前列素+ LDOx 組 (2.53 [0.08],  $P = 0.001$ [多重比較校正  $P$  值,  $P = 0.002$ ]) 以及麥角新碱+ HDOx 組 (2.82 [0.15],  $P < 0.001$  [ $P < 0.001$ ])與單獨給予縮宮素相比顯著改善收縮性。但麥角新碱+ LDOx 組(2.47 [0.13],  $P = 0.01$  [ $P = 0.08$ ]) 和卡前列素 + HDOx 組 (2.51 [0.20],  $P = 0.05$  [ $P = 0.24$ ])與單獨給予縮宮素相比有更高的平均收縮性，但無統計學差異。

**結論：**在縮宮素預處理的子宮肌層，縮宮素誘導的收縮衰減與既定的縮宮素受體脫敏現象相關。如果子宮肌層未行縮宮素預處理，縮宮素是最強的子宮收縮劑。然而，對於經縮宮素預處理的子宮肌層，協同作用較明顯，縮宮素聯合應用麥角新碱或卡前列素與單獨給予縮宮素相比，具有更顯著的收縮效應。尚需進行體內試驗以明確體外實驗的差異是否具有臨床意義。

（隋永恆 譯 陳傑 校）

**BACKGROUND:** The objective of this study was to compare the in vitro contractile effects of the combination of oxytocin (low dose and high dose) with either ergonovine or carboprost in myometrial strips from women undergoing cesarean delivery (CD), and to study the effect of oxytocin pretreatment on these contractions. We hypothesized that the use of ergonovine or carboprost in combination with oxytocin would improve contractility compared with oxytocin alone.

**METHODS:** Myometrial samples obtained from women undergoing elective CD were pretreated in organ bath chambers with either oxytocin 10–5 M (experimental) or physiological salt solution (control) for 2 hours. They were then washed and subjected to dose-response testing with oxytocin, ergonovine, or carboprost (10–10 to 10–5 M), either alone or in combination with a fixed low-dose (10–10 M) (LDOx) or high-dose (10–6 M) (HDOx) oxytocin. The amplitude, frequency, area under the curve, and motility index (amplitude  $\times$  frequency) of contractions during the dose-response period were analyzed with linear regression models, and compared among the groups. The primary outcome was the motility index across the study groups.

**RESULTS:** One hundred sixty-nine experiments were done in samples obtained from 56 women. The mean square root of the motility index [standard error] ( $\sqrt{g \cdot \text{contractions}/10 \text{ min}}$ ) of oxytocin was significantly higher in the control (3.40 [0.24]) versus experimental group (2.02 [0.15]) ( $P < 0.001$ ). When all control groups were compared, the motility index of oxytocin (3.21 [0.25]) was higher than that of ergonovine (2.13 [0.30],  $P < 0.001$  [multiple comparisons adjusted  $P$  value,  $P < 0.001$ ]), carboprost (1.88 [0.10],  $P < 0.001$  [ $P < 0.001$ ]), ergonovine + LDOx (2.07 [0.15],  $P < 0.001$  [ $P < 0.001$ ]), and carboprost + LDOx (1.82 [0.15],  $P < 0.001$  [ $P < 0.001$ ]) and was not different than that of ergonovine + HDOx (3.39 [0.32],  $P = 0.68$  [ $P = 0.99$ ]) and carboprost + HDOx (2.68 [0.30],  $P = 0.20$  [ $P = 0.60$ ]). However, in oxytocin-pretreated groups, carboprost + LDOx (motility index: 2.53 [0.08],  $P = 0.001$  [multiple comparisons adjusted  $P$  value,  $P = 0.002$ ]) and ergonovine + HDOx (2.82 [0.15],  $P < 0.001$  [ $P < 0.001$ ]) exhibited significantly superior contractility response compared with oxytocin alone, while ergonovine + LDOx (2.47 [0.13],  $P = 0.01$  [ $P = 0.08$ ]) and carboprost + HDOx (2.51 [0.20],  $P = 0.05$  [ $P = 0.24$ ]) showed higher mean contractility response compared with oxytocin alone but failed to reach statistical significance in adjusted analyses.

**CONCLUSIONS:** The attenuation of oxytocin-induced contractility in oxytocin-pretreated myometrial strips is in keeping with the previously established oxytocin-receptor desensitization phenomenon. Oxytocin is the most effective of the uterotonics tested if the myometrium is not preexposed to oxytocin. However, in the oxytocin-pretreated myometrium, a synergistic response is evident, and the combination of oxytocin with either ergonovine or carboprost produces superior response compared with oxytocin alone. Further in vivo studies in humans are necessary to determine whether these differences identified in vitro are clinically significant.

### 小兒腹腔鏡膽囊切除術中雙側椎旁神經阻滯 (T7-10) 與切口局部麻醉比較：一項前瞻性隨機臨床研究

#### Bilateral Paravertebral Blockade (T7-10) Versus Incisional Local Anesthetic Administration for Pediatric Laparoscopic Cholecystectomy: A Prospective, Randomized Clinical Study

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**背景：**單次椎旁神經阻滯 (paravertebral nerve blocks, PVBs) 為接受腹腔鏡膽囊切除術 (laparoscopic cholecystectomy, LC) 的成年患者提供了有效的術後鎮痛。本研究試圖比較小兒腹腔鏡手術中 PVBs 與切口局部麻醉藥注射作用的差異。

**方法：**將 83 名 (8–17 歲) 擇期 LC 患者隨機分為 2 個治療組：PVB 組於椎旁間隙和切口處分別注入 0.5% 羅呱卡因和生理鹽水，切口浸潤組則於椎旁間隙和切口處分別注入生理鹽水和 0.5% 羅呱卡因。術後鎮痛選擇氫嗎啡酮自控鎮痛至術後 12 小時，之後給予經考酮和氫嗎啡酮。記錄 24 小時內鎮痛藥的總用量、疼痛的連續視覺類比評分、主觀疼痛控制滿意度、疼痛的類型和特徵、併發症等內容。

**結果：**PVB 組的術中芬太尼用量 (ng/kg/min) 比切口浸潤組更少 (12.81 vs 16.57,  $P = 0.007$ )。兩組的術後鎮痛藥消耗總量和平均視覺類比評分無顯著差異。僅在切口浸潤組中，術前記錄的基線疼痛與術後自述疼痛評分呈相關性。兩組的併發症類似且發生率低。兩組患者主訴的切口痛、內臟痛、脹氣痛的發生率沒有區別。然而切口浸潤組的肩部疼痛發生率減少 49% (95% 置信區間, 0.269–0.893)。

**結論：**PVBs 並沒有減少小兒腹腔鏡術後疼痛, 卻降低了術中芬太尼的用量。

(柳韶華 譯 陳傑 校)



**BACKGROUND:** Single-injection paravertebral nerve blocks (PVBs) provide effective postoperative analgesia after adult laparoscopic cholecystectomy (LC). We sought to compare PVBs with local anesthetic injections at laparoscopic port sites in a pediatric population.

**METHODS:** Eighty-three patients (8–17 years old) scheduled for LC were randomized prospectively to 2 treatment groups: the PVB group received ropivacaine 0.5% injected in the paravertebral space and normal saline injections at laparoscopic instrument sites, and the port infiltration group received normal saline in the paravertebral space and ropivacaine 0.5% at instrument sites. Postoperative analgesia was provided with hydromorphone via patient-controlled analgesia for up to 12 hours, followed by oxycodone and hydromorphone. The total amount of analgesic, serial visual analog scale scores for pain and subject pain control satisfaction, type and characteristics of pain, and complications were recorded for 24 hours.

**RESULTS:** The intraoperative fentanyl requirement (ng/kg/min) was lower in the PVB group than in the port infiltration group (12.81 vs 16.57,  $P = 0.007$ ). Total postoperative analgesic consumption and mean visual analog scale scores were not different between the groups. Baseline pain recorded before surgery correlated with self-reported postoperative pain scores only in the port infiltration group. The rate of complications was low and similar between groups. There was no difference in incidence of patient-reported incisional, visceral, or gas pain. Shoulder pain, however, was 49% less (95% confidence interval, 0.269–0.893) in the port infiltration group.

**CONCLUSIONS:** PVBs did not reduce postoperative pain associated with pediatric LC but decreased intraoperative fentanyl requirements.

### 健康志願者中肌間溝造影劑的分佈

#### The Disposition of Radiocontrast in the Interscalene Space in Healthy Volunteers

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**背景：**本研究測量了肌間溝內高壓力（大於 15 磅）和低壓力（小於 15 磅）下注射造影劑的擴散差異。

**方法：**對 9 名健康志願者行超聲引導下雙側肌間溝內各注射 10ml 不透 X 線的 0.9%NaCl。通過電腦斷層掃描來評估造影劑的擴散，記錄注射時不適感。

**結果：**兩種壓力情況下注藥，藥物均接觸到三個臂叢神經根，並在頸筋膜下達到前斜角肌和/或中斜角肌表面。

**結論：**無論注射壓力如何，肌間溝都被 10ml 不透 X 線的造影劑填滿。

(林雨軒 譯 陳傑 校)

**BACKGROUND:** We measured the spread of radiocontrast in the interscalene space after injection under low (<15 psi) and high (>20 psi) pressures.

**METHODS:** Nine healthy volunteers received ultrasound-guided injections of 10 mL radio-opaque NaCl 0.9% in both interscalene spaces. Spread of injectate as assessed by computed tomography scan and discomfort on injection were recorded.

**RESULTS:** Under both opening pressure conditions, injectate contacted 3 brachial plexus roots and spilled over the surface of the anterior and/or middle scalene muscles underneath the cervical fascia.

**CONCLUSIONS:** Regardless of injection pressure, the interscalene space was filled with 10 mL of radiocontrast injectate.