

Thoracic epidural morphine-only infusion for acute pain management after lumbar spine surgery: a retrospective comparative study

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BACKGROUND

- Spinal surgery that involves fusion is very painful procedure¹
- Continuous epidural local anesthetic infusion via an epidural catheter placed through the surgical site is an effective analgesic option postoperatively;² however, there is a risk of surgical site infection associated with the epidural catheter
- Morphine administered to the epidural space is absorbed into the cerebrospinal fluid and produces analgesic effects regardless of the spinal level of catheter placement³
- We predict that continuous epidural morphine-only infusion should provide good postoperative analgesia after spine surgery, even with an epidural catheter placed remote to the surgical site

METHODS

STUDY DESIGN

Retrospective comparative study (Research Ethics Committee approval number: 2024308)

PARTICIPANTS

Patients who underwent lateral lumbar interbody fusion (LLIF)* and percutaneous pedicle screw (PPS) under general anesthesia at Kansai Medical University Medical Center

*LLIF includes extreme lateral interbody fusion (XLIF) and oblique lateral interbody fusion (OLIF)

EXPOSURE

Patients who received epidural morphine-only infusion for postoperative analgesia after LLIF+PPS from January to June in 2024

CONTROL

Patients who received IV fentanyl infusion for postoperative analgesia after LLIF+PPS from January to June in 2023

OUTCOME

- Primary outcome
- NRS for rest pain on the morning of the postoperative day (POD) 1
- Secondary outcomes
- NRS for pain during movement on POD1 morning
 - Intraoperative remifentanyl and fentanyl doses
 - Supplemental analgesic use within 24 hours postoperatively
 - Incidence of postoperative nausea and vomiting
 - Incidence of pruritus
 - Complications related the epidural catheters

Continuous morphine-only epidural infusion at the mid-thoracic level may be helpful to mitigate pain after lumbar spine surgery, ensuring the catheter is remote to the surgical site



Fig. 1 Incisions and catheter positions

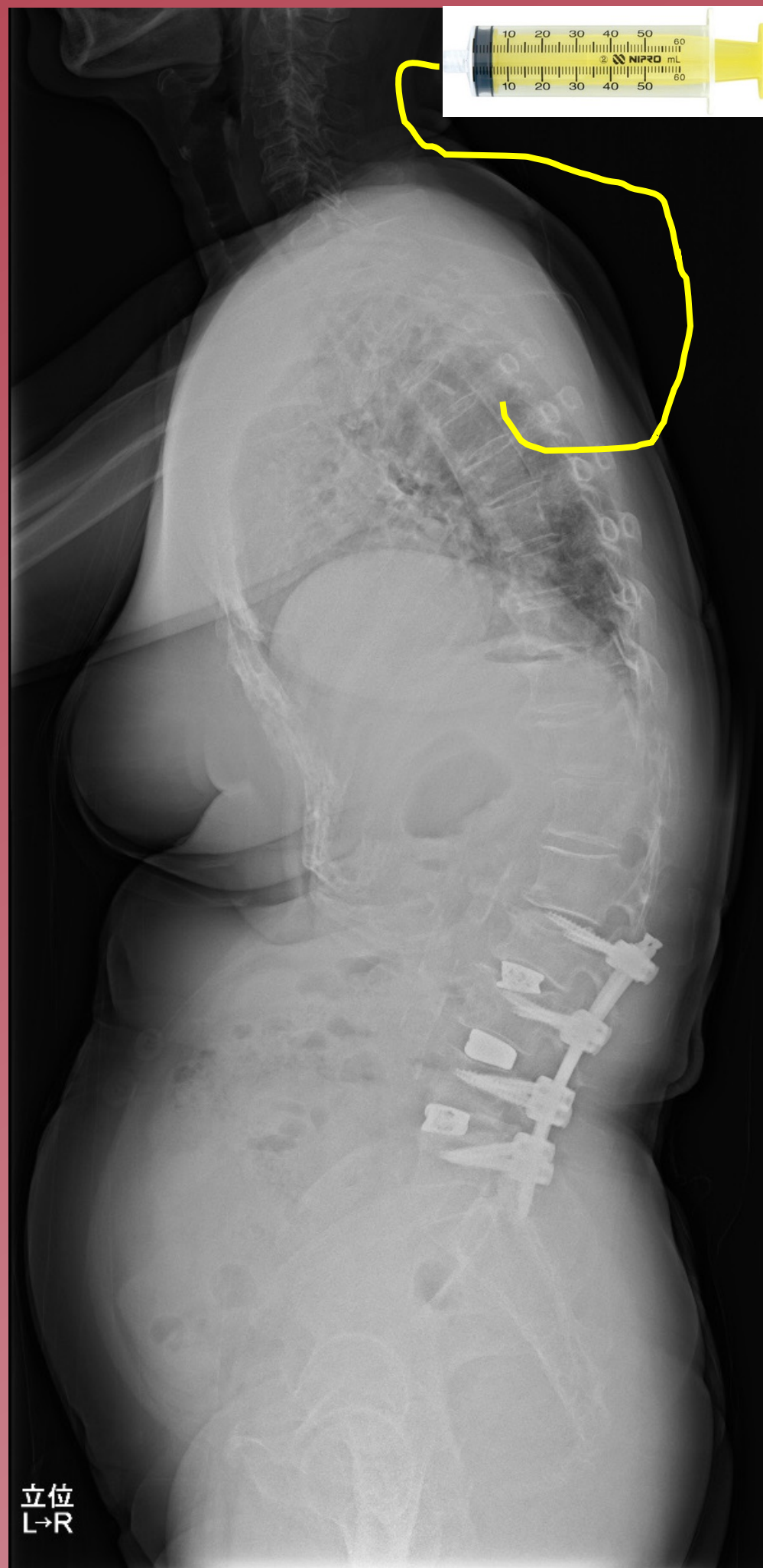


Fig. 2 X-ray after surgery

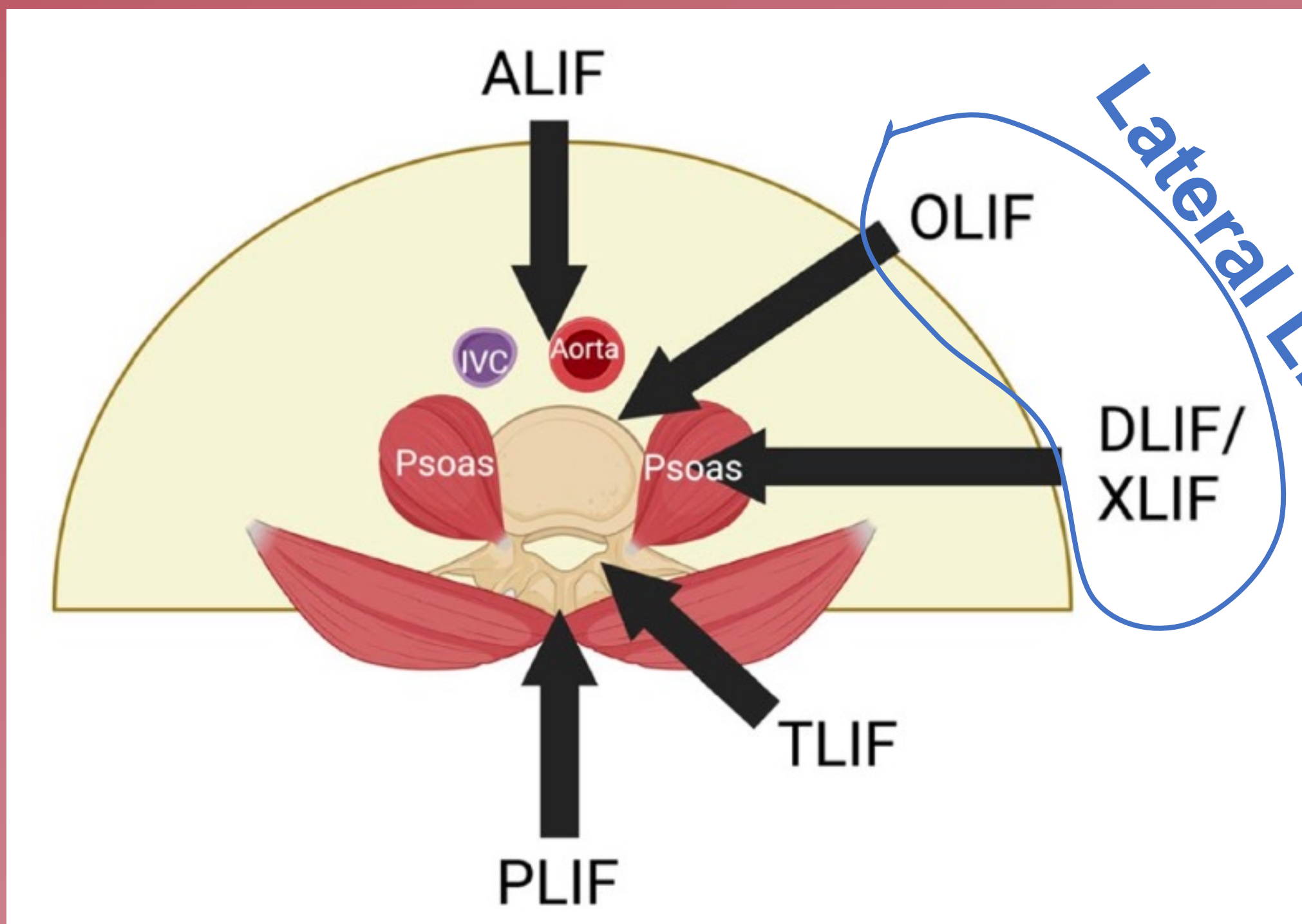


Fig. 3 Different approaches for lumbar interbody fusion (Cited from Ref. #4 and modified)

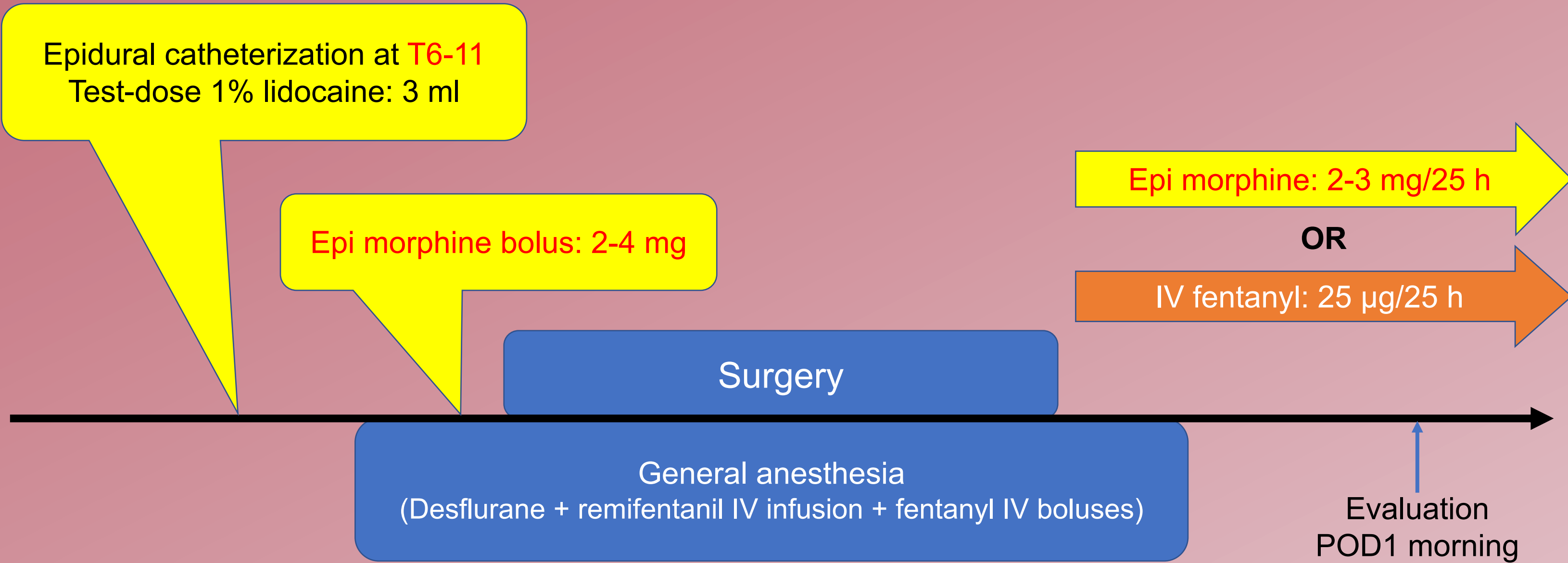


Fig. 4 Time course of perioperative pain management

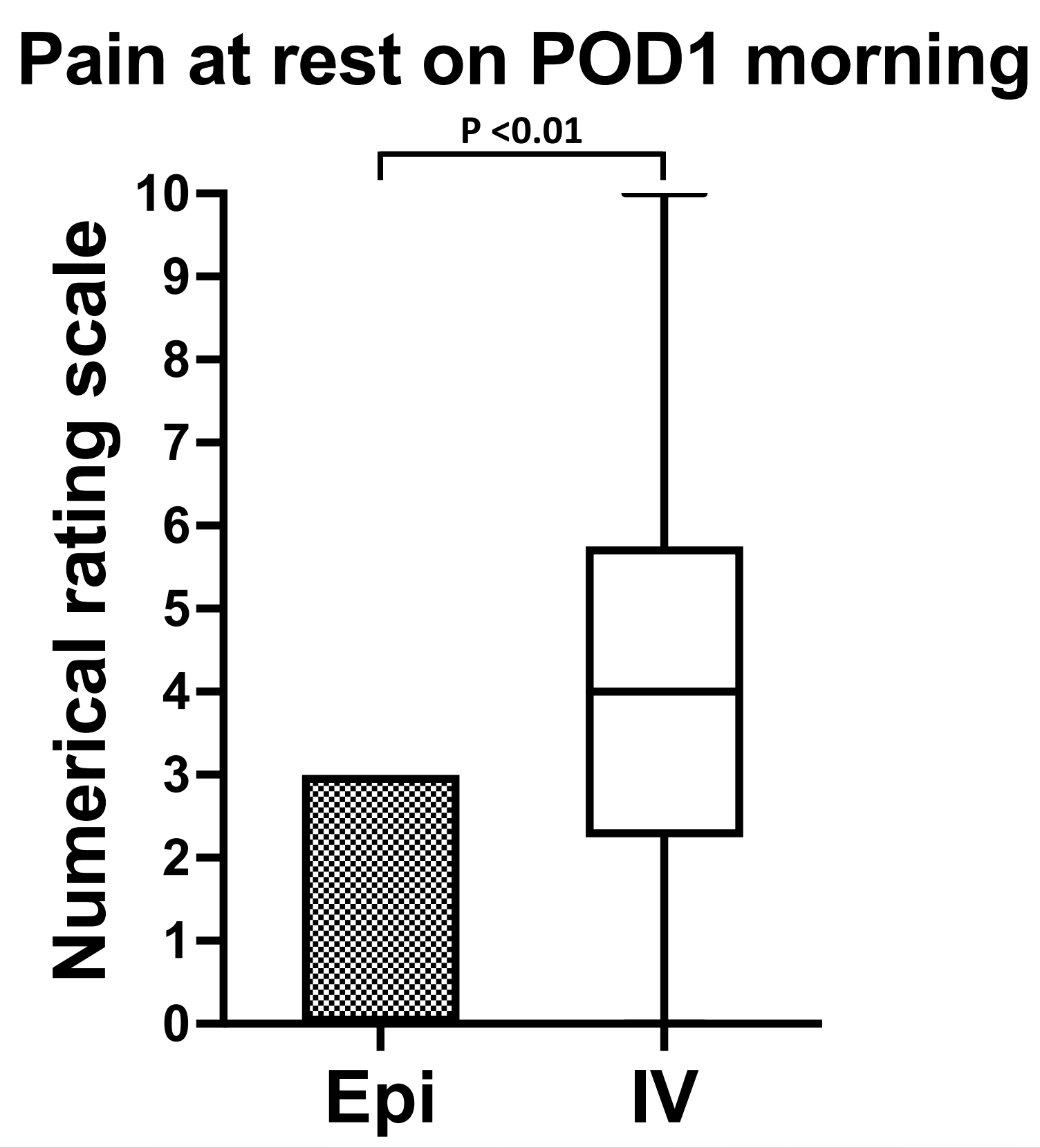


Fig. 5 NRS for rest pain on POD1 morning

RESULTS

Table 1. Baseline demographics of study patients

	Epidural (n = 9)	IV fentanyl (n = 28)	p value
Age, years	76 (57–84)	74.5 (32–90)	0.56
Sex, female	8 (89%)	16 (57%)	0.12
Height, cm	151.6 (9.5)	158.7 (10.4)	0.07
Weight, kg	55.1 (9.9)	58.9 (16.1)	0.51
Body mass index	24.2 (4.9)	23.0 (3.5)	0.42
ASA physical status, 2/3	8/1	25/3	>0.99
Diagnosis, Spondylolisthesis/Compression fracture/Canal stenosis/Scoliosis/DSA	8/1/0/0/0	24/1/1/1/1	0.77
Surgical procedure, XLIF+PPS/OLIF+PPS/XLIF+PPS+corpectomy	5/3/1	7/19/2	0.12
Surgical time, min	172 (44)	144 (75)	0.31
Anesthesia time*, min	277 (57)	224 (85)	0.09
Epidural catheter location, T6-7/T7-8/T8-9/T10-11	3/1/4/1	NA	NA

ASA, American Society of Anesthesiologists; DSA, destructive spondyloarthropathy; XLIF, extreme lateral interbody fusion; PPS, percutaneous pedicle screw; OLIF, oblique lateral interbody fusion.
*Anesthesia time includes time needed for epidural catheterization in the operating rooms.
Data are presented as median (range), mean (SD), or number (proportion).

Table 2. Anesthesia related outcomes of patients

	Epidural (n = 9)	IV fentanyl (n = 28)	p value
Pain at rest on POD1 morning (NRS)	0 (0–3 [0–3])	4 (2.25–5.75 [0–10])	<0.01
Pain during movement on POD1 morning (NRS)	5 (1.5–6 [0–8])	4.5 (3.25–6 [0–10])	0.59
Intraoperative remifentanyl average infusion rate, µg/kg/min	0.07 (0.06–0.11 [0.04–0.28])	0.12 (0.10–0.15 [0.05–0.24])	0.01
Intraoperative fentanyl dose, µg/kg	5.4 (3.7–6.1 [3.0–9.3])	5.2 (4.2–6.8 [2.2–11.1])	0.67
Supplemental analgesic use within 24 h postoperatively	1 (0–4 [0–6])	2 (1.25–4 [0–9])	0.24
Nausea	4 (44.4)	9 (32.1)	0.69
Vomiting	0 (0)	5 (17.9)	0.31
Antiemetic use within 24 h postoperatively	0 (0–1 [0–1])	0 (0–1 [0–2])	>0.99
Pruritus	5 (55.6)	3 (10.7)	0.01

POD, postoperative day; NRS, numerical rating scale.
Data presented as median (interquartile range [range]) or number (proportion).
P values were calculated using the Mann–Whitney *U* test or Fisher’s exact test, as appropriate.

- No other complications related to the epidural morphine infusion, such as respiratory depression, bleeding, and infection, were observed

DISCUSSION

- Continuous epidural morphine-only infusion significantly reduced rest pain 24 hours after LLIF and PPS (difference in median [95% CI]: 4 [1–4]) compared to IV fentanyl infusion
- Patients receiving the epidural morphine infusion experienced pruritus significantly more often than those receiving IV fentanyl infusion
- Morphine (a hydrophilic opioid) administered into the epidural space eventually diffuses into the intrathecal space³
- Morphine circulating in the cerebrospinal fluid (CSF) produces analgesic effects regardless of the spinal level of injection³
- Nordberg et al.⁵ reported that the concentration of morphine in CSF after 6 mg epidural morphine injection reached a maximum level in CSF after 135 ± 40 minutes and its terminal elimination half-life was 239 ± 10 minutes
- LLIF and PPS may be a good indication for epidural morphine infusion since these procedures do not manipulate the spinal canal, keeping its anatomy, including the epidural space, intact⁴
- Ensuring the epidural catheter is remote to the surgical area may be beneficial to prevent the surgical site infection caused by the catheter

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