

False Negative Epidural Aspiration – A Benchtop Investigation

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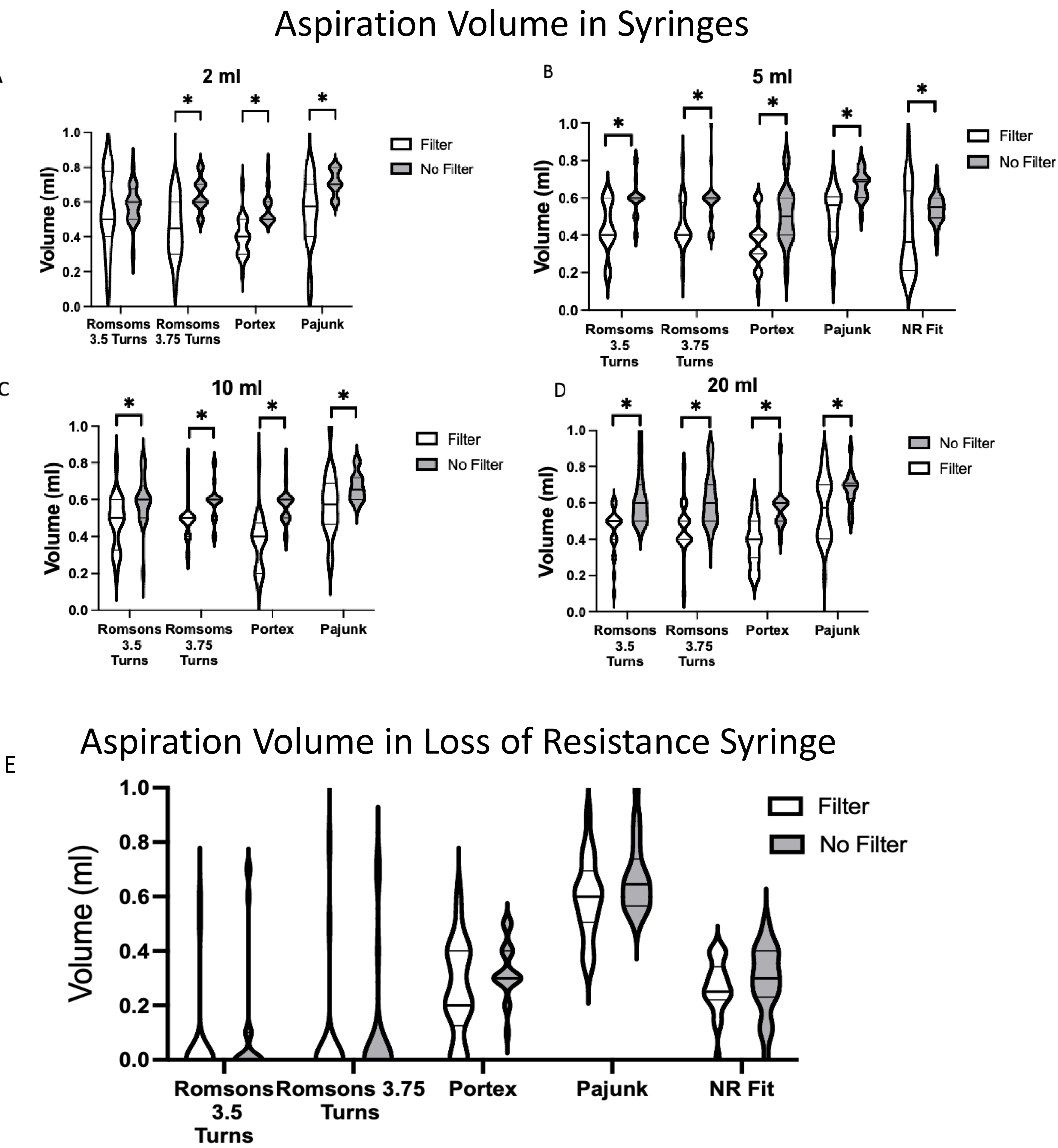
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Introduction

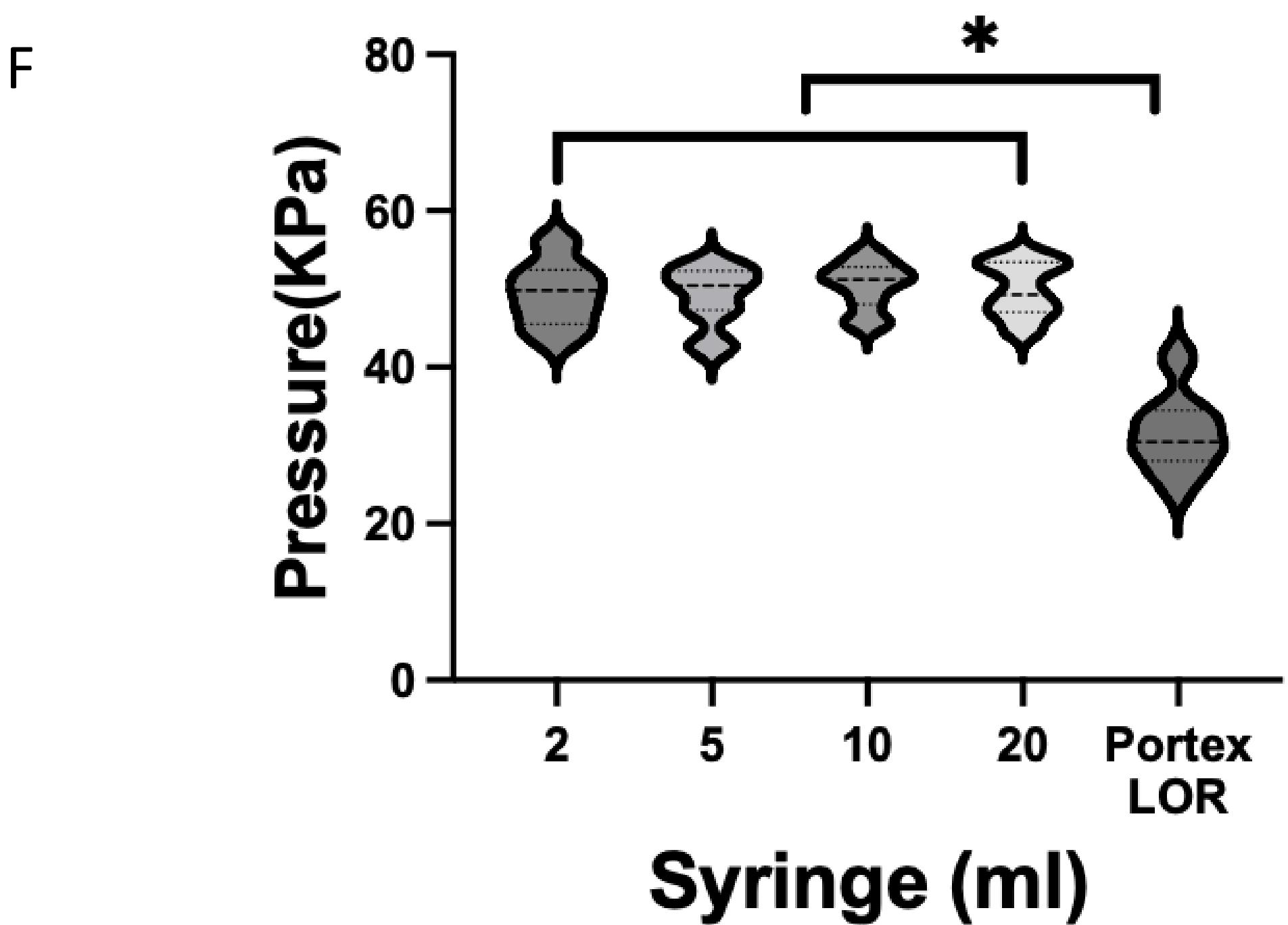
In order to prevent accidental intrathecal injection and consequent high neuraxial blockade epidural catheters should be aspirated prior to injection of medication. There is no standardized technique for this and there are many cases in the literature in which high neuraxial blockade occurred despite the anesthesia provider reporting a prior negative catheter aspiration.¹ We sought to examine the return of aspirate in a benchtop model to determine the optimal method of catheter aspiration. In particular we were interested in the relationship between syringe size, removal of the filter and connector type

Methods

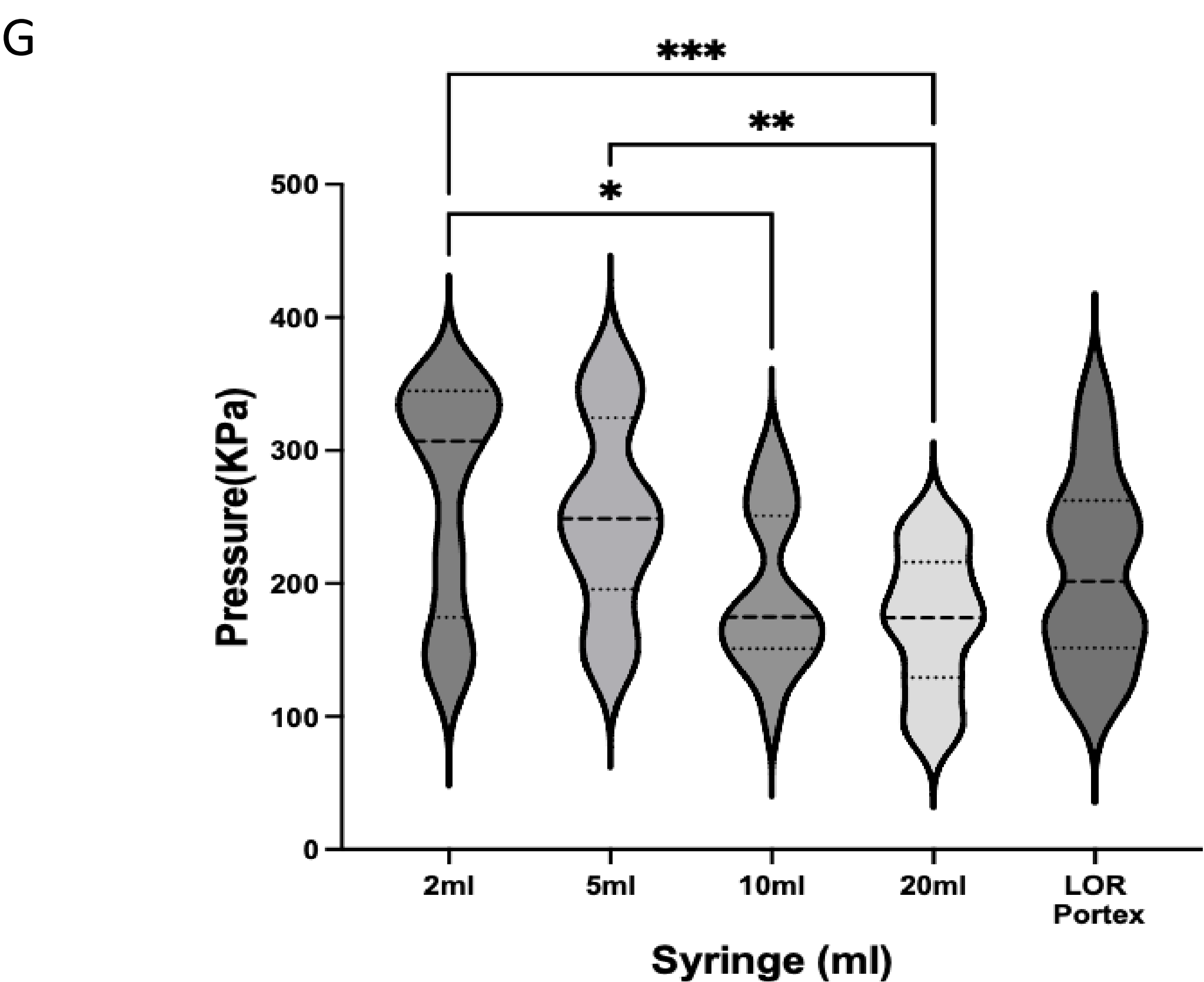
This was a bench top model using a commercially available epidural sets (catheter, filter, connector and syringes). Equipment by Portex, Pajunk and Romsons was examined. Room temperature water was used as a CSF equivalent and was aspirated for 5 seconds by participating anesthesiologists using the epidural catheter with and without the associated filter using 2, 5, 10, 20 ml and the loss of resistance syringes. Pressures generated by injection and aspiration with different syringes were measured in an engineering laboratory. The primary outcome was the volume of aspirate returned. Secondary outcomes were the pressures generated on injection and aspiration



Aspiration Pressure in Syringe



Injection Pressure in Syringe



Results

The volumes aspirated were consistently less than 1 ml, typically 0.4 to 0.6 ml. There were minimal differences between 2, 5, 10 and 20 ml syringes (Graph A, B, C, and D) in volume aspirated. LOR syringes by Portex and Romsons but not Pajunk had the smallest volumes (Graph E). Zero volume aspirates were seen only in the Romsons LOR syringe. Removal of the filter consistently increased the volume aspirated by 0.1 – 0.2 ml. Overtightening the screw cap connector did not affect volume return. The pressure generated by syringe injection (Graph G) was greatest with smaller syringes but there was no difference in pressure on aspiration (Graph F).

Conclusions

Syringe size has no effect on volume returned in an epidural catheter. The advantage of a small syringe is the ability of the operator to see the aspirate that might not be clearly visible in a larger syringe. Filter removal results in a modest increase in volume returned and must be balanced against the risk of infection. Aspiration should be standardized

References

1. Radwan MA, O'Carroll L, McCaul CL. Total spinal anesthesia following obstetric neuraxial blockade: a narrative review. International Journal of Obstetric Anesthesia. 2024 Aug 1;59:104208