



# MP15-17: CLINICAL MEASUREMENT OF MAXIMUM SAFE URETERAL INTERNAL CIRCUMFERENCE USING A NOVEL FORCE SENSOR



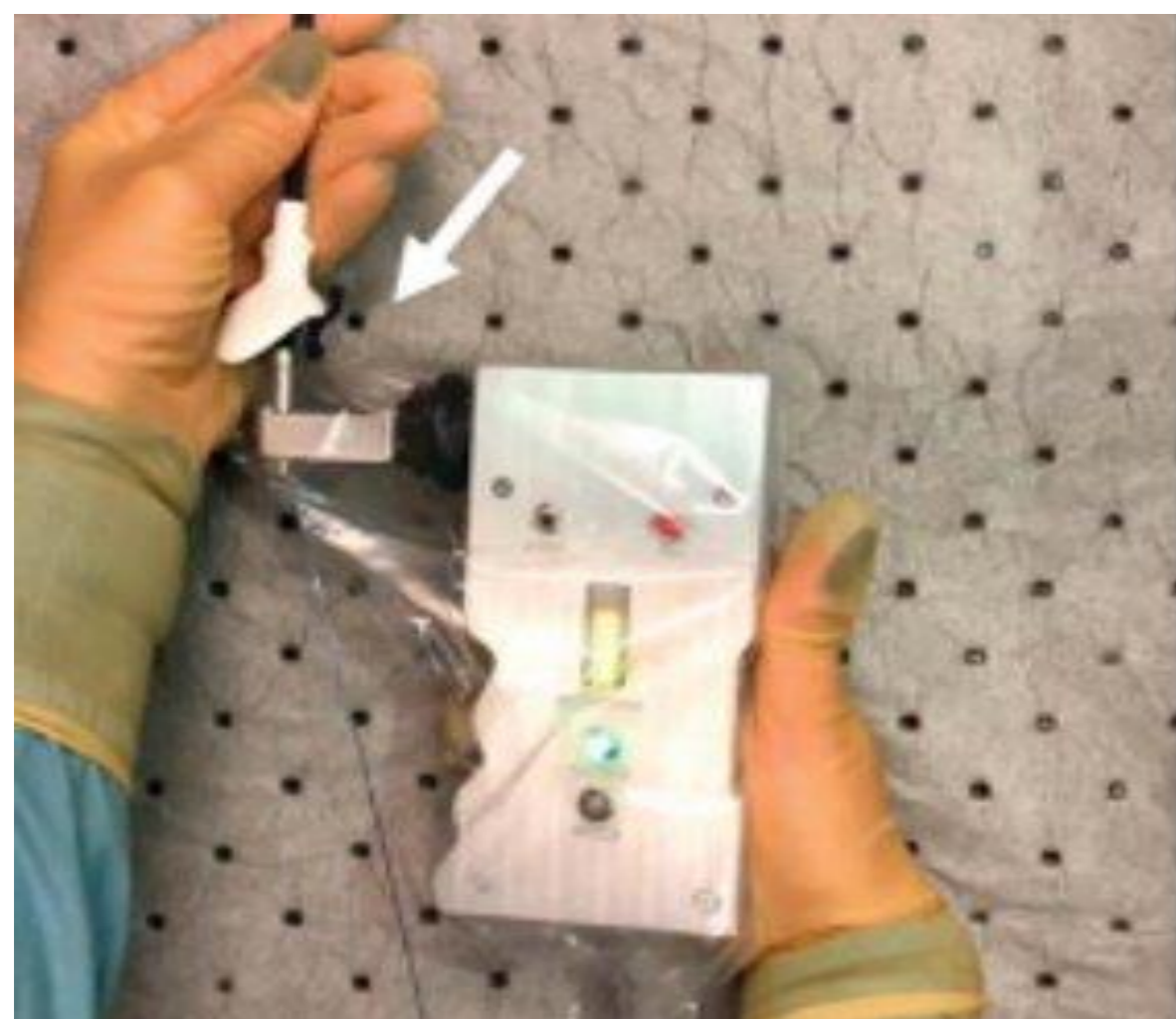
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## INTRODUCTION

- Ureteral caliber has implications for renal access such as allowing deployment of a larger ureteral access sheath (UAS)<sup>1</sup> while avoiding the need for balloon dilation or pre-stenting which necessitates a second procedure and is associated with cost and patient discomfort<sup>2,3</sup>.
- Despite its importance, no studies have explored the maximum, atraumatically sized diameter of the human ureter.
- Using the novel UC Irvine force sensor, we evaluated the largest ureteral luminal circumference at forces  $\leq 6$  Newtons (N), the previously described force threshold for ureteral injury<sup>4</sup> (Figure 1).



**Figure 1.** The novel UCI force sensor which can measure forces up to 1/100<sup>th</sup> of a Newton. The interface with the ureteral access sheath is highlighted by the white arrow.

## METHODS

- Following IRB approval, we sized ureters during URS/PCNL procedures with the UCI force sensor (n = 54, 20 male, 34 female).
- 37 cm long Cook® urethral dilators (10 Fr to 24 Fr) were passed in 2 Fr increments until a maximum force of 6 N was observed.
- After sizing of the ureter, a UAS of similar size (maximum 16 Fr) was placed for the remainder of the procedure.
- A post ureteroscopic lesion scale (PULS) was assigned at the conclusion of the procedure.

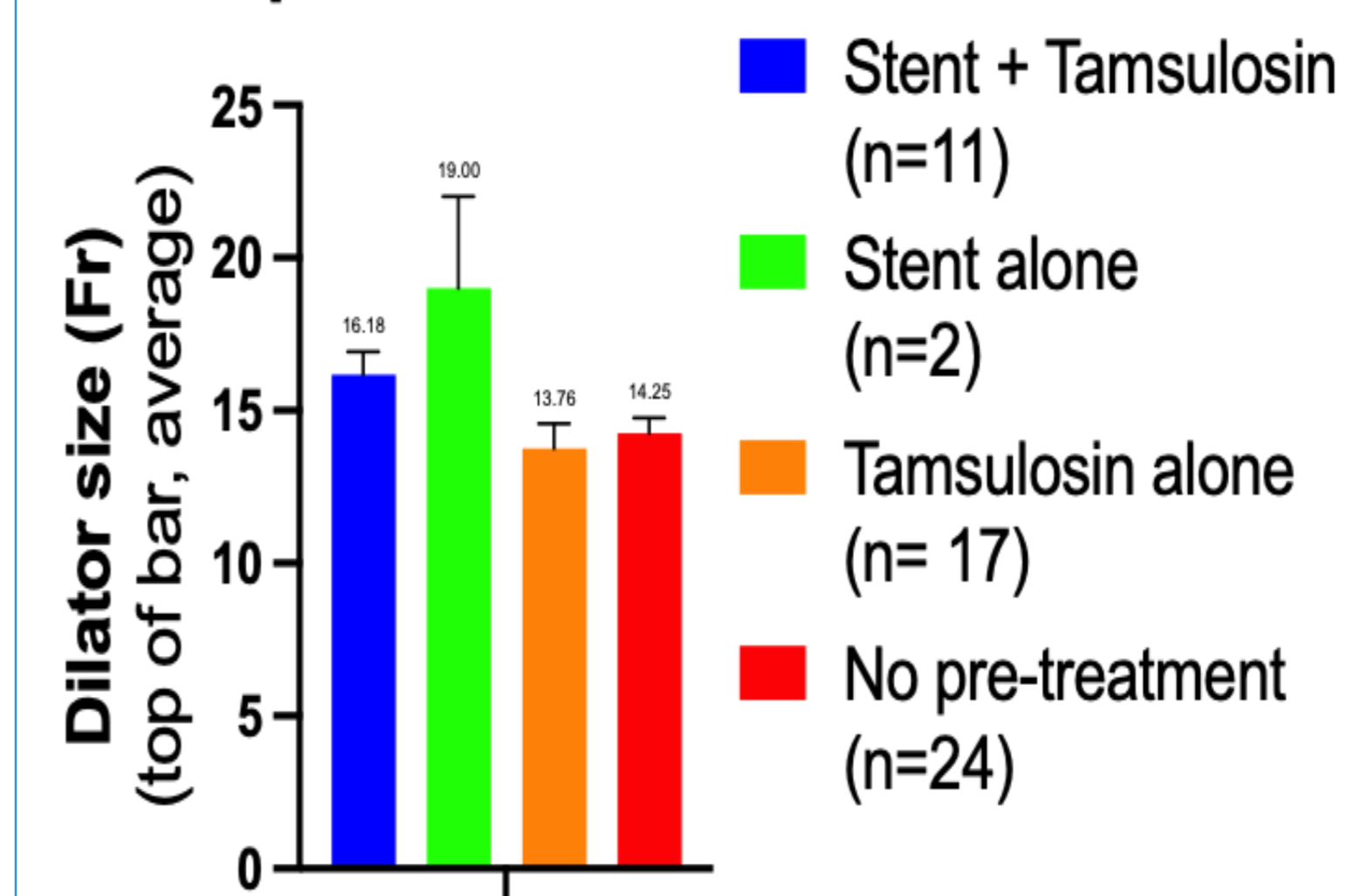
## RESULTS

- A linear regression with adjustment for covariant effect showed stents increased successful dilator size (stent vs no stent; 17.28 vs 13.92,  $p = 0.004$ ) (Figure 2A).
- The use of tamsulosin did not result in a larger dilator compared to patients with no pretreatment (tamsulosin vs no pretreatment; 13.76 vs 14.25,  $p = 0.2985$ , CI [-2.354, 1.3834]) (Figure 2A).

## RESULTS

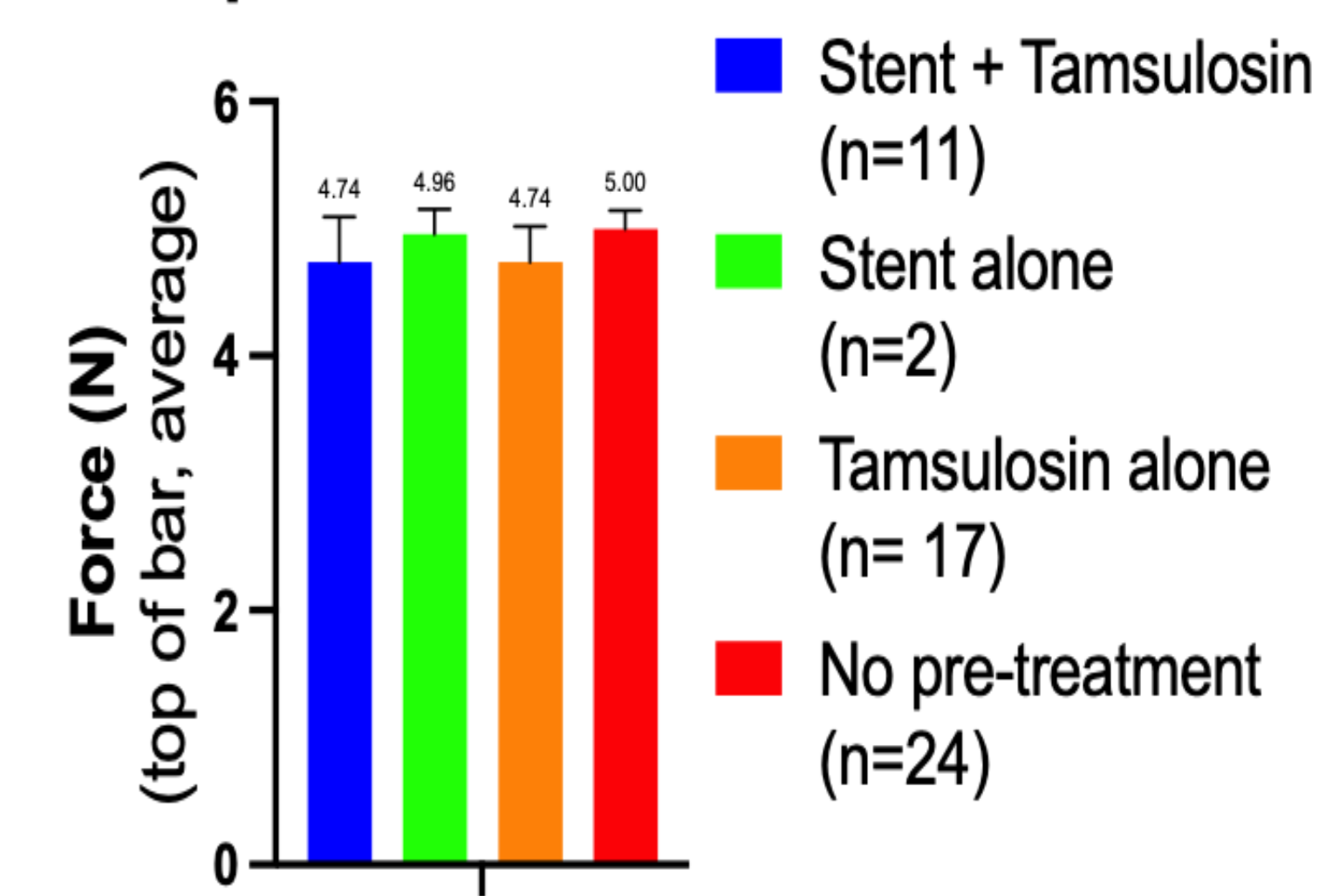
A.

Maximum successful dilator placement size



B.

Maximum successful dilator placement force



**Figure 2.** (A) The average dilator placement size for each of the 4 treatment groups was greater than 14 Fr and (B) the average maximum force for all groups during successful dilation was 5 N.

## CONCLUSIONS

- At a force of insertion of  $\leq 6$  N, 67% of ureters safely accommodated a 14 Fr dilator.
- Almost half of ureters (43%) safely accommodated a 16 Fr dilator.
- Patients with indwelling stents were able to accept a 3.4 Fr larger dilator compared to patients without stents.

