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# Effect of Duration of Symptoms on Orchiectomy Rates in Testicular Torsion in Patients Under 25: Important Prognostic Trends

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## INTRODUCTION

### BACKGROUND

Testicular torsion (TT) is one of the leading pediatric urologic emergencies; each year over 13,000 males under the age of 25 are at risk of testicular loss. TT follows a bimodal distribution, primarily occurring at 0-1 and 12-17 year olds.

TT is caused by twisting of the spermatic cord, leading to hemorrhagic infarction if left untreated. A variety of pathophysiological mechanisms have been proposed, congenital defects being the most commonly cited. "Bell-clapper Deformity" is a congenital malformation in which the gubernaculum is improperly attached to the scrotal sac, resulting in a horizontal testis that is predisposed to twisting and subsequently inducing ischemia. If detorsion is performed prior to testicular death, reperfusion injury mediated by reactive oxidative species (ROS) can additionally damage the cells and result in fertility defects. A variety of pharmacological treatments have been proposed that have theoretically beneficial effects upon reperfusion injury, primarily targeting a reduction of ROS generation and ROS end products via anti-oxidants. However, they have demonstrated mixed results in rats and are currently of limited clinical application.

The presentation of testicular torsion is well documented and distilled to the TWIST criteria, a collection of symptoms shown to be sensitive for torsion. The TWIST criteria are scored from 0-7, with the categories consisting of:

- High Riding Testicle (1)
- Nausea/Vomiting (1)
- Loss of Cremasteric Reflex (1)
- Hard Testicle (2 – all or none; either 0 or 2)
- Testicular Swelling (2 - all or none; either 0 or 2)

These criteria have been validated in non-urological providers with scores of 0 indicating low risk and no need for Ultrasound evaluation, 1-5 intermediate risk and recommended ultrasound, and 6+ as probable torsion with a need to operate. In assessments done by urologists, the ranges were tighter with low risk 0-2, intermediate risk 3-4, and high risk 5+. A limitation of the TWIST criteria is that they have been tested in children Tanner Stage 3-5, addressing only 1 peak of the bimodal distribution.

In 1933, Hellner utilized animal models to assess factors associated with orchiectomy risk, identifying Duration of Symptoms (DOS) and degree of torsion as significant. Currently these variables along with possibly spermatic cord thickness are believed to be the primary predictors of testicular loss. Research on this topic has been scarce, with many sources drawing on Hellner's 1933 data. A review of the literature regarding DOS found that 6 hours or less has been cited as necessary to achieve salvage rates of >90%, data which had originally stemmed from Hellner's models. Interestingly, up to 12 hours DOS has been associated with variable testicular loss rates, ranging from 50% according to the animals models and down to 11% based on a paper reviewing testicular torsion cases in Bristol. However, the Bristol series demonstrated grim data past 12 hours, with orchiectomy rates near 75%.

## CURRENT STUDY

### PURPOSE

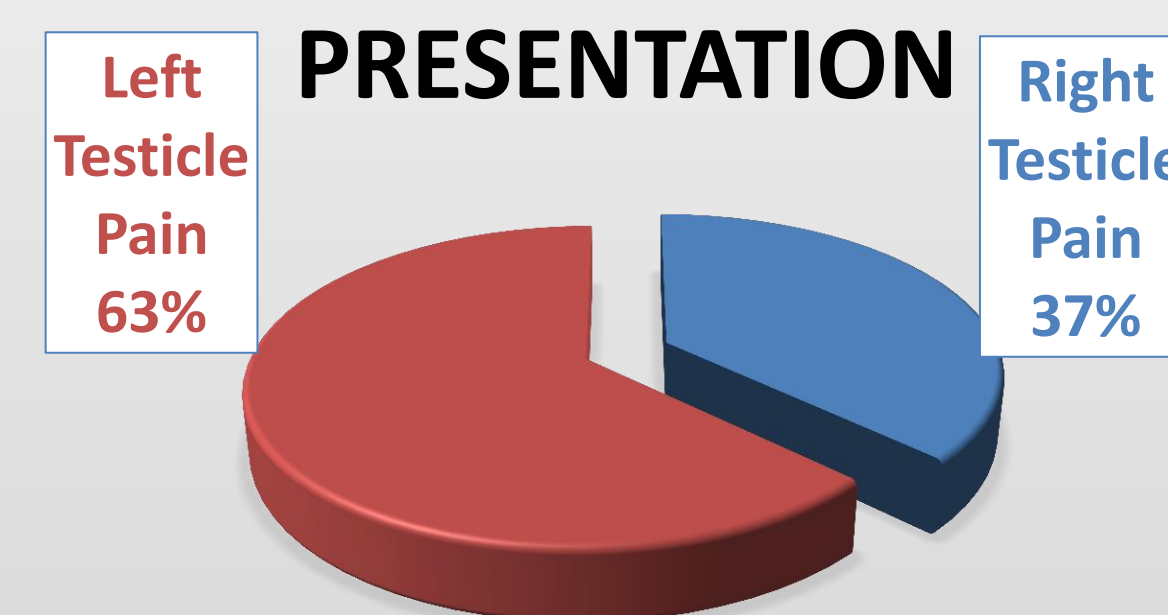
The purpose of this study is to explore the relationship between duration of symptoms in testicular torsion and the effect on orchiectomy rates, with the intention of establishing an updated timeline for clinical management and surgical urgency.

### METHODS

We conducted a retrospective cross-sectional study reviewing 65 testicular torsion cases from 2010-2016 at Westchester Medical Center. Emergency department registration forms for each patient were assessed for duration of symptoms prior to arrival at the ED. The surgical operative report was subsequently analyzed for the procedures performed as well as the outcome: Orchiopexy or Orchiectomy. The surgical outcomes were then compared against the duration of symptoms. 3 patients were excluded from final analysis due to insufficient data.

### RESULTS

We observed a clear downward trend in the rate of testicular salvage over time. Patients with 0-6 hours DOS had 100% salvage rate, as did patients DOS 6-12 hours. In the group of patients with DOS 12-24 hours the salvage rate fell to 86%, and finally patients with over 24 hours DOS had a 43% salvage rate. For all patients between 0 and up to 24 hours DOS, 97% (33/34) of patients had an orchiopexy. Average DOS for orchiectomy patients was 72.7 hours, while for orchiopexy patients DOS was dramatically lower at 16.43 hours. The average age in the study's patient population was 11.12. Left sided torsion was more common than right, with a L:R ratio of 1.7.

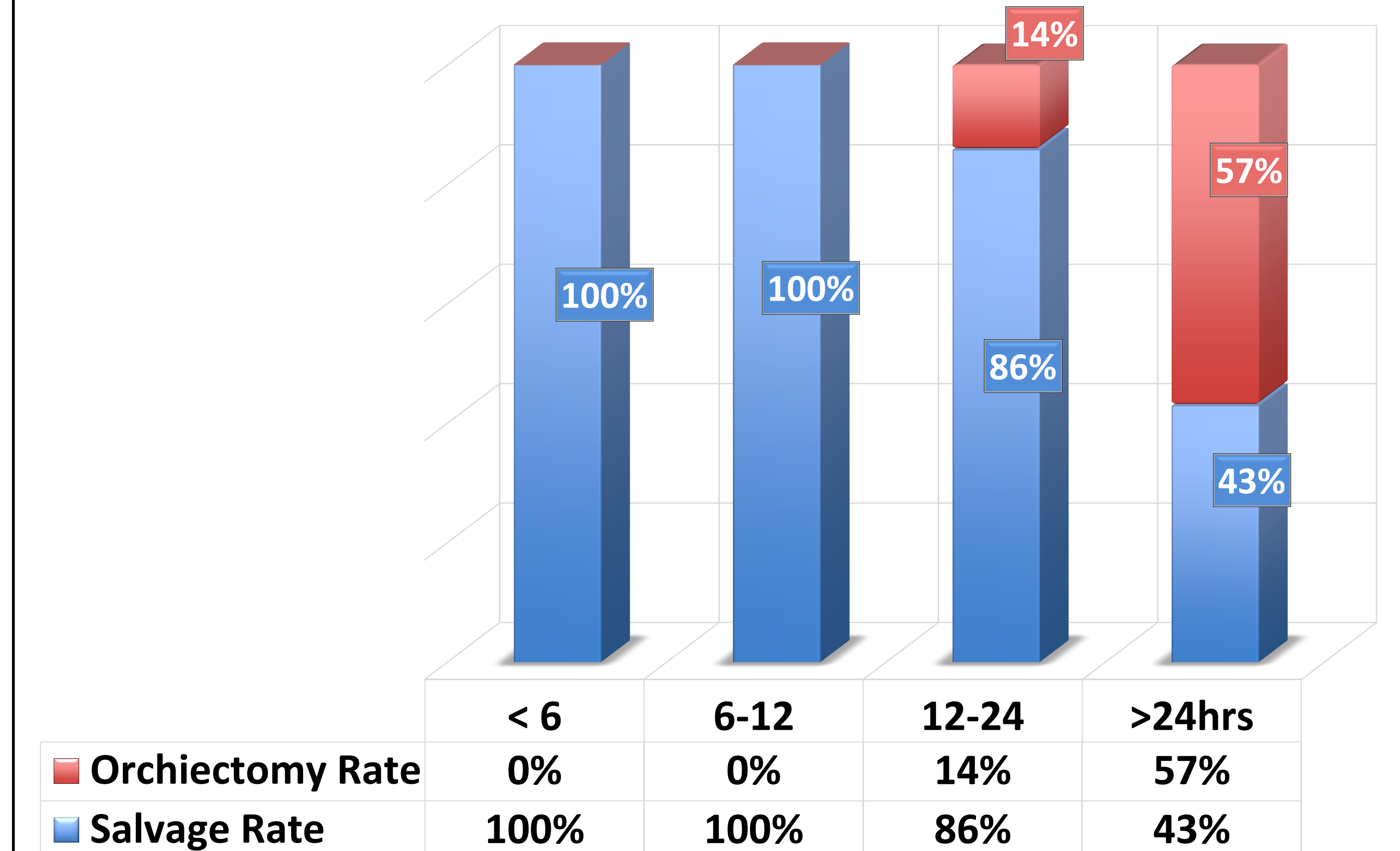


## CONCLUSIONS

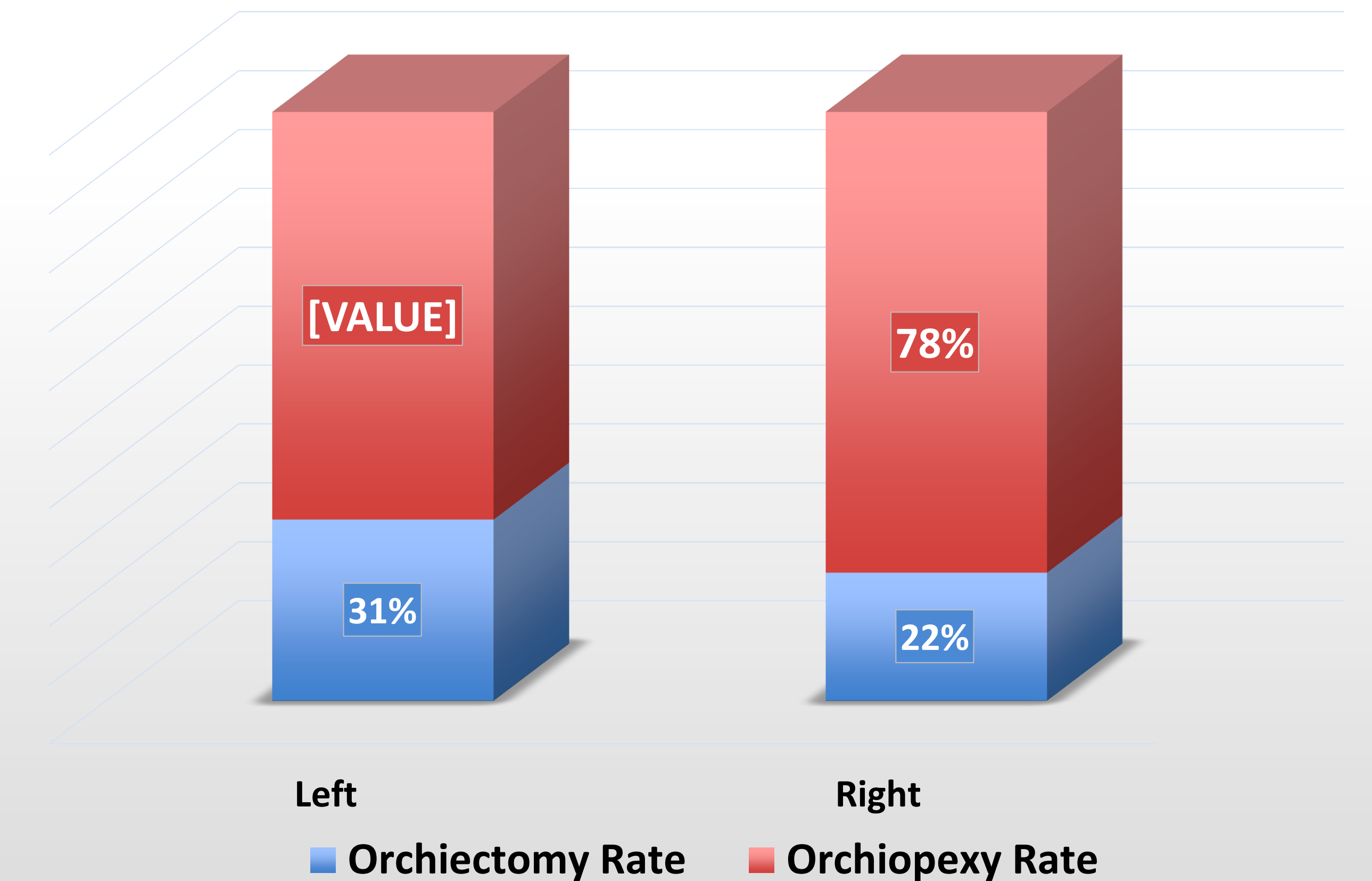
Our data indicates that the window of opportunity 90% testicular salvage extends far beyond the currently accepted "6 hour golden rule" of duration of symptoms. This new timeframe can provide urologists with updated accuracy of prognostic data, allowing for a more conscientious and informed decision regarding patient triage. At our institution, duration of symptoms (DOS) up to 12 hours had a salvage rate of 100%, and a rate of 97% at up to 24 hours of symptoms. Further stratification of the patients as grouped by duration of symptoms showed a mild drop in salvage rate between 12 and 24 hours, followed by a steep decline in salvage rates thereafter, supporting the assertion that the longer the DOS, the more urgent the nature of the presentation.

## RESULTS

### SURGICAL OUTCOME BY DURATION OF SYMPTOMS



### SURGICAL OUTCOME BY PRESENTATION



## IMPLICATIONS

The data presented here have important implications for the field of Urology. The treatment timeframe for testicular torsion is primarily based on animals studies with little clinical input into the formulations of treatment algorithms. This study may contribute to the establishment of a new standard of care, in which patients arriving to the emergency department beyond 6 hours DOS would still be viewed as good candidates for testicular salvage. The urgent need for change in the treatment of TT is highlighted by the observed 97% salvage rate at under 24 hours DOS. These patients, who under current standards may be considered for elective orchiectomy, would benefit significantly from urgent surgical intervention.