

## INTRODUCTION

- Post-traumatic elbow dysfunction in children may be caused by many different conditions including:
  - Contractures following distal humeral or radial head fractures<sup>1</sup>
  - Posterolateral rotatory instability following a dislocation or significant valgus stress<sup>2</sup>
  - Osteochondritis dissecans of the capitellum following repetitive compressive and shearing forces exerted by the radial head<sup>3</sup>
- The final common pathway is post-traumatic elbow dysfunction comprised of pain, limited range of motion, and loss of function at the elbow joint<sup>4,5,6,7</sup>.
- There are numerous post-traumatic unilateral elbow scoring systems developed for adults<sup>8</sup>, but none have been validated for the pediatric population.
- To address this gap, we are developing the Pediatric Elbow Evaluation Tool (PEET) which subjectively and objectively evaluates the impact of elbow dysfunction in all of the domains of the World Health Organization (WHO) International Classification of Function, including activity, participation, and quality of life.
- As part of the development of PEET, we are interested in comparing the functional activity component of PEET with the patient-rated questionnaire assessment of elbow function from the popular adult Liverpool Elbow Score (LES).

## OBJECTIVE

- To determine if a validated subjective questionnaire that is currently used to evaluate elbow function in adults (LES) correlates with the functional video assessment component of PEET.

## METHODS

- Institutional Review Board approval was obtained for a prospective study. Participants were recruited from the outpatient sub-specialty clinics at Shriners Hospital for Children Northern California (SHCNC).
- A total of 15 children were recruited into the patient group. The mean age was 10.80 years old, and there were 7 males and 8 females (Table 1).

TABLE 1. Demographics of Case Subjects (n = 15)

Sex	
Male	7
Female	8
Handedness	
Left	3
Right	12
Affected side	
Left	6
Right	9
Age, mean ± SD years	10.80 ± 2.83
Height, mean ± SD inches	58.54 ± 5.58
Weight, mean ± SD pounds	110.14 ± 40.82

### Selection Criteria for Patient Population

- Ages: 5-16 of any gender or ethnicity
- Diagnosis of unilateral post-traumatic elbow dysfunction
- Exclusion Criteria: developmental delay, medical co-morbidities that limit function or participation in activities, or parental or child inability to understand and read English or Spanish

### PEET Components

- PEET consists of a survey questionnaire, functional video assessment, and physical examination of the elbow.

### Data Analysis

- A Spearman's correlation coefficient was calculated to analyze the relationship between the LES patient-rated questionnaire of elbow function and the functional video assessment.

TABLE 2. Liverpool Elbow Score Patient-Rated Questionnaire

Answer the following questions thinking back the past four weeks	Never	Once or twice	Sometimes	Many times	Every time
How often have you had to use your other arm to do things normally done by the affected arm?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in combing your hair?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in washing yourself?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in feeding yourself?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in dressing yourself?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in trying to do household activities?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem caused you any difficulty in lifting, e.g. a kettle, a milk bottle, groceries?	None	Little	Moderate	Severe	Unable to do
How would you describe the pain from this elbow?	None	Little	Moderate	Severe	Unable to do
Has your elbow problem affected your sport and leisure activities?	None	Little	Moderate	Severe	Unable to do

TABLE 3. PEET Functional Assessment

	With ease	Substitution	Unable to do
Comb or put hair in a ponytail			Unable to do
Fasten top button of shirt			Unable to do
Don sock			Unable to do
Reach in back pocket			Unable to do
Jump rope			Unable to do
Chest pass with basketball			Unable to do
Shoot a basketball			Unable to do
Underhand volleyball serve			Unable to do
Volleyball bump pass (both hands)			Unable to do
Push up			Unable to do

## RESULTS

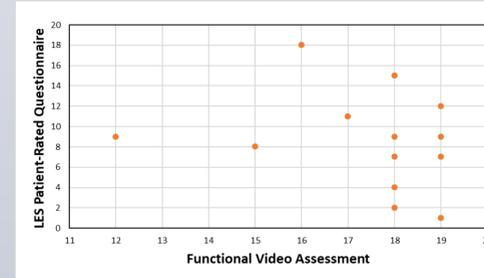
- Of the 15 patients, only 13 completed both the LES patient-rated questionnaire and the functional video assessment and were included in the analysis.
- The Spearman's correlation coefficient, rho or  $\rho$ , was calculated to be -0.29 (p-value = 0.34).
- There was no significant correlation between the LES patient-rated questionnaire and the functional video assessment (FVA).

TABLE 4. Individual FVA and LES Scores

Subject	FVA Score	LES Score	Rank FVA Score	Rank LES Score
1	15	8	2	6
2	16	18	3	13
3	18	7	7	4.5
4	12	9	1	8
5	18	9	7	8
6	19	9	11.5	8
7	18	4	7	3
8	19	7	11.5	4.5
9	19	1	11.5	1
10	17	11	4	10
11	18	15	7	12
12	19	12	11.5	11
13	18	2	7	2

Rho ( $\rho$ ) -0.29  
p-value 0.34

Figure 1. FVA Score vs. LES Score



## CONCLUSIONS

- There is no relationship between the LES patient-rated questionnaire and the functional video assessment.
- This may be due in part to the fact that the LES focuses primarily on tasks related to activities of daily living, whereas the functional video assessment also includes elements of physical activity and sport.
- Additionally, we were only able to test a small number of subjects, which limits the power of the study.

## FUTURE DIRECTIONS

- Recruitment for the study is still ongoing. We are planning to test 25 more patients.
- As we recruit more participants, we will use the data to continue to refine the most important aspects of PEET.
- It is our goal to develop a comprehensive tool to assess for post-traumatic elbow dysfunction.
- PEET will be used in future studies to assess outcomes before and after surgery for pediatric post-traumatic elbow dysfunction.

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