Pediatric Elbow Evaluation Tool (PEET)

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OBJECTIVE

To determine whether the Pediatric Elbow Evaluation Tool distinguishes between children with post-traumatic elbow dysfunction and those with normal elbow function

BACKGROUND

- Elbow injuries are very common in children—approximately 8-9% of all upper extremity fractures in this population involve the elbow[1]
- Post-traumatic elbow dysfunction can be a complicated problem to diagnose and treat in children and adolescents, who manifest this condition differently than adults[2]
- Pediatric elbow injuries lead to unique challenges such as damage to open growth plates, propensity for dislocation, and long-term deformities[3]
- Current elbow evaluation tools are designed for adults[4] and validated pediatric function questionnaires are not specifically designed to assess the impact of elbow dysfunction
- Validated functional evaluation tools are important for assessing treatment options
- Validated outcome measures generally consist of 2 parts:
    - Subjective: patient questionnaire regarding patient's pain and daily activities[5]
    - Objective: physician assessment of range of motion, functional measurements, and other relevant physical findings
- We have combined existing elbow evaluation tools, a functional assessment that takes into account developmentally appropriate activities, and a physicians assessment to develop the Pediatric Elbow Evaluation Tool (PEET)

MATERIALS AND METHODS

PEET is composed of:

1. A questionnaire based on currently existing elbow evaluation tools such as the adult Liverpool questionnaire, the Pediatric Outcomes Data Collection Instrument, and the Patient-Reported Outcomes Measurement Information System, which have not been validated in the pediatric population for elbow dysfunction
2. A physician's assessment of common physical exam measurements for post-traumatic elbow patients
3. A functional assessment based on daily activities.

Selection Criteria

Patient Population:

- Ages 5-16 with unilateral, post-traumatic elbow dysfunction

Control Population

- Ages 5-16 without a history of elbow injury or upper extremity problems

Exclusion Criteria

Developmental delay or medical co-morbidities that limit the subject's ability to perform the activities and inability to understand English or Spanish

Recruitment

- Subjects were recruited from the Shriners Hospital for Children Northern California
- Controls were recruited through a flyer posted around the hospital as well as in the clinic, often through siblings who accompanied patients.
- Goal: 40 controls and 40 patients
- To date, 31 controls and 15 patients have been tested

Data Analysis

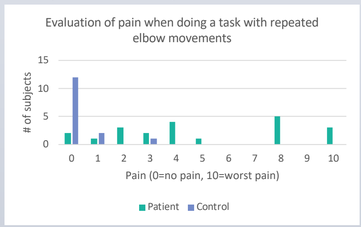
- A Mann-Whitney U-test was used to compare the patient and control group and to test the significance of each of the items of the three PEET components

RESULTS

Patient Questionnaire

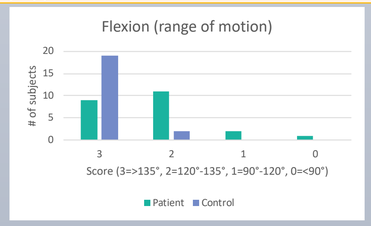
Evaluation of pain	Sig
Today	.007*
At its worst	.000*
At rest	.012*
Lifting a heavy object	.000*
When doing a task with repeated elbow movements	.000*
At night	.007*
Self-evaluation of Cosmesis	**Sig**
Does the appearance of the arm bother you?	.000*
Are you teased about your arm by other children?	.485
Liverpool Adult Questionnaire	**Sig**
How often have you had to use your other arm to do things normally done by the affected arm?	.000*
Has your elbow problem caused you any difficulty in combing your hair?	.000*
Has your elbow problem caused you any difficulty in washing yourself?	.075
Has your elbow problem caused you any difficulty in feeding yourself?	.005*
Has your elbow problem caused you any difficulty in dressing yourself?	.004*
Has your elbow problem caused you any difficulty in trying to do household activities?	.000*
Has your elbow problem caused you any difficulty in lifting, e.g. a kettle, a milk bottle, groceries?	.000*
How would you describe the pain from this elbow?	.000*
Has your elbow problem affected your sport and leisure activities?	.000*

- All of the evaluation of pain questions rose to statistical significance (23 patients, 15 controls) as well as 8 of the 9 Liverpool Adult Questionnaire items (24 patients, 31 controls)



Physician's Assessment

Range of Motion	Sig
Flexion	.000*
Ext Block	.003*
Pronation	.132
Supination	.334
Signs	**Sig**
Ulnohumeral	.002*
Radiocapitellar	.003*
Medial flexor origin	.150
Lateral extensor origin	.172
Medial collateral ligament	.162
Posterior interosseous nerve	.339
Crepitance	.003
Ulnar Nerve Tinel's	.006



- Of the physician's assessment, 6 of the 21 items (flexion ROM, extension ROM, ulnohumeral tenderness, radiocapitellar tenderness, crepitance, and ulnar nerve tinel's sign showed significant differences between groups

Functional Assessment

Activity	Sig
Push up	.014*
Chest pass a basketball	.005*
Shoot a basketball	.252
Jump rope	.714
Comb hair	.005*
Fasten top button of shirt	.089
Underhand volleyball serve	.009*
Volleyball bump pass (both hands)	.014*
Don sock	.180
Reach in back pocket	1.000

*statistically significant with a significance level of 0.05

CONCLUSIONS

Each component of PEET has elements that distinguishes between children with post-traumatic elbow dysfunction and those with normal elbow function

FUTURE DIRECTIONS

- Continue subject and control recruitment
- Refine PEET based on items that are able to discriminate patient vs. control with statistical significance as well as examine individual components of the tool to examine ability of a section to stand alone as an evaluation tool
- Validate PEET for differentiating between pre-op and post-op patients

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