Utilizing PedANAM Data and Review of Systems Questionnaire as Indicators for the Presence of Neurocognitive Dysfunction in Patients with Childhood-Onset Systemic Lupus Erythematosus

Nathan Tuchscherer, Catherine Robben, Megan Quinlan-Waters, Hermine I. Brunner MD, MSc, MBA

Introduction

What is childhood-onset systemic lupus erythematosus (cSLE)?
- A chronic, multisystem autoimmune disease that manifests in children <18 years old

What are some common symptoms and characteristics of cSLE?
- Fever, rash, mucositis, arthritis, malaise, renal disease, and weight loss
- Higher prevalence of developing neurocognitive dysfunction (NCD)
- Characterized by antibodies against self-antigens including antinuclear antibodies (ANA), anti-double-stranded DNA, antiphospholipid antibodies, anti-smith, and anti-ribonucleoprotein

How is cSLE diagnosed?
- While the presence of ANA and previously mentioned symptoms are key characteristics in most diagnoses of cSLE, diagnosing cSLE is still considered a process of exclusion
- Analyzing clinical symptoms and lab workup with classification criteria for systemic lupus erythematosus by the American College of Rheumatology (ACR) is the current standard for diagnosing cSLE

What is the pediatric automated neuropsychological assessment metric (PedANAM)?:
- A computerized library of subtests designed to measure cognitive ability, mental processing speed, memory, and cognitive efficiency in children aged 9 years and older

Why do cSLE patients take the PedANAM?
- With neuropsychiatric disease affecting 43%-55% of patients with cSLE, the PedANAM offers clinicians a quantitative measurement of a patient’s cognitive ability that can be utilized to aid in identifying and diagnosing cognitive disorders.

What is a review of systems (ROS) questionnaire?
- A list of consistent questions that the provider asks the patient about symptoms that are constitutional or system specific

Methodology

Data Collection:
- Retrospective chart review
- PedANAM scores, ROS questionnaires, demographics, and medications were collected
- In total, 134 PedANAM tests were analyzed

Inclusion Criteria:
- Diagnosed with SLE and taken at least 1 PedANAM

PedANAM Analysis:
- Scored on two scales: cognitive performance scores (CPS): CPS-PCA and CPS-multiscore
- CPS-PCA is a principal component analysis method that uses the accuracy score of the subtests within the PedANAM
- CPS-multiscore is a regression method of subtest accuracy in the PedANAM

Comparing PedANAM scores and ROS questionnaires (Figure 1):
- 7 tests with a significance value of 0.05 was performed testing for correlation between the number of “yes” responses and the quality of life in children with cSLE
- The racial and ethnic proportions of the population in this study are not representative of the racial and ethnic proportions outlined in the literature
- Prednisone was taken by 41% of the population
- Hydroxychloroquine was taken by 90% of the population

Results: Objective 1

Comparing PedANAM scores and current pain (Figure 2):
- Chi-square test with a significance value at 0.05 was performed testing for relationship between “No More Than Minimal Chronic Pain” (reported current pain scores of 0-3) and “More Than Minimal Chronic Pain” (reported current pain scores of 4-10) with PedANAM scores that indicated NCD

Comparing PedANAM scores and average pain over the past week (Figure 3):
- Chi-square test with a significance value at 0.05 was performed testing for relationship between “No More Than Minimal Chronic Pain” (reported average pain scores of 0-3) and “More Than Minimal Chronic Pain” (reported average pain scores of 4-10) with PedANAM scores that indicated NCD

ROS Questionnaire Analysis (Table 3):
- Logistic regression analysis
- Cramer’s V values yielding low/moderate strength of association for the questions indicated to ROS Questions

Results: Objective 2

Table 1. Demographics/Characteristics of Patients with NCD Indication

| Characteristic | N (%)
|---------------|------
| Ethnicity     |     |
| White         | 64 (48)
| Black         | 26 (20)
| Hispanic      | 13 (10)
| Asian         | 5 (4)
| Multiracial   | 7 (6)
| Sex           |     |
| Female        | 70 (53)
| Male          | 64 (49)

Table 2. Patient Medications during Episode of NCD (n=134)

| Medication | N (%)
|------------|------
| Ibuprofen  | 60 (45)
| Hydroxyzine| 55 (41)
| Methotrexate| 12 (9)
| Azathioprine| 9 (7)
| Methotrexate| 7 (6)
| Prednisone | 6 (5)
| Labetalol  | 6 (5)
| Naproxen   | 6 (5)
| Celecoxib  | 5 (4)
| Naproxen   | 5 (4)
| Atorvastatin| 5 (4)
| Celecoxib  | 5 (4)
| Naproxen   | 5 (4)

Results: Objective 3

Table 3. Chi-Square Tests of ROS Questions and PedANAM Scores (n=134)

<table>
<thead>
<tr>
<th>Question</th>
<th>p-value</th>
<th>Cramer’s V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0.054*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Sleep</td>
<td>0.0057**</td>
<td>0.3858</td>
</tr>
<tr>
<td>Difficulty Sleeping</td>
<td>0.0118</td>
<td>0.3286</td>
</tr>
<tr>
<td>Cognitive Dysfunction</td>
<td>0.0352*</td>
<td>0.2597</td>
</tr>
<tr>
<td>Muscle Weakness</td>
<td>0.0105*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Rash</td>
<td>0.0025*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Night Sweats</td>
<td>0.0017*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Headache</td>
<td>0.056*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Nausea</td>
<td>0.1462</td>
<td>0.2812</td>
</tr>
<tr>
<td>Fatigue</td>
<td>0.0352*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Low Mood on Waking</td>
<td>0.0105*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Night Sweats</td>
<td>0.0017*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Inability to Concentrate</td>
<td>0.0352*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Nausea</td>
<td>0.0352*</td>
<td>0.2812</td>
</tr>
<tr>
<td>Low Mood on Waking</td>
<td>0.0105*</td>
<td>0.2812</td>
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<td>0.0017*</td>
<td>0.2812</td>
</tr>
</tbody>
</table>

Results: Objective 3 (cont.)

Conclusions

• When conducting a ROS questionnaire, a patient with cSLE that answers “yes” to experiencing tiredness, depression, difficulty sleeping, change in personality, muscle weakness, neck pain, or headache indicates a greater likelihood of the presence of NCD.
• Further, the greater number of “yes” responses to the questions that were found to have association with PedANAM score indicates an even greater chance of NCD.
• There is a significant relationship between reported pain score, current average over the past week, and indication of NCD from the PedANAM.
• At least moderate pain and the presence of ROS questions that are associated with disease activity in cSLE may be a trigger to screen for NCD.

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References