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PANDAS: How to Recognize and Intervene

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PANDAS: How to Recognize and Intervene

Trevor Brackney

A scholarly paper submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Science

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College of Nursing
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ABSTRACT

This research paper delves into pediatric autoimmune neuropsychiatric disorder associated with streptococcus (PANDAS). PANDAS causes rapid psychiatric changes in children ages 3 to puberty. These changes are most often obsessive-compulsive disorder (OCD) and/or tics, however, anxiety, agitation, mood disorder, depression, oppositional defiance disorder, attention-deficit hyperactivity disorder, hallucinations, memory/cognitive deficits, enuresis, and sleep disturbances have also been noted. Present-day estimations of PANDAS cases would likely prove to be understated if awareness of PANDAS increased (Centner, 2021). The purpose of this paper is to disseminate awareness and data of a disease that has gone relatively unnoticed in American medicine since being defined as a novel disease in 1998 (Perlmutter et al., 1999). Awareness is essential to those who care for pediatric populations. It is hoped that increased awareness will lead to improved care of these children (Wilbur et al., 2019).

PANDAS: How to Recognize and Intervene

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College of Nursing, BYU
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Keywords: Pediatric, Obsessive-compulsive disorder, Tics, Group A streptococcus, Psychiatry, Autoimmune
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PANDAS: How to Recognize and Intervene

Introduction

Imagine, a well-adjusted 9-year-old child with no previous medical or psychiatric history who had an overnight change in personality accompanied by symptoms of obsessive-compulsive disorder (OCD). A change so severe it caused considerable disruption in the patient’s and her family’s lives. Pediatric autoimmune neuropsychiatric disorder associated with streptococcus (PANDAS) does just that.

While still considered rare, PANDAS is purported to account for up to 10% of the roughly 500,000 cases of OCD in the United States (Pabst & Subasic, 2020). Present-day estimations of PANDAS cases would likely prove to be understated if awareness of PANDAS increased (Centner, 2021). The purpose of this paper is to disseminate awareness and data of a disease that has gone relatively unnoticed in American medicine since being defined as a novel disease in 1998 by Doctor Susan Swedo (Perlmutter et al., 1999). Awareness is essential to those who care for pediatric populations. It is hoped that increased awareness will lead to improved care of these children (Wilbur et al., 2019).

Clinical Presentation

A previously healthy 9-year-old female presented to an outpatient pediatric clinic. Caregivers noted a 2 week history of the acute onset of a compulsion to wash her hands after using the restroom, and olfactory and tactile hallucinations. Olfactory hallucinations consisted of a persistent smell of fecal matter despite thorough hand washing. Caregivers noticed that she would wash her hands for several minutes (up to 5 minutes), only to still smell fecal matter on them. These olfactory hallucinations would then compel her to start the handwashing ritual over again. Tactile hallucinations consisted of a “wet feeling” around her groin and upper legs. These
tactile hallucinations would occur nightly around bedtime and came about at the same time as the hand washing compulsions and olfactory hallucinations.

When her medical practitioner asked if the patient had experienced a recent sore throat, the patient stated that she had a sore throat a few weeks before the handwashing and hallucinations began. The sore throat symptoms were not severe and only lasted a few days. These sore throat symptoms were so mild that the patient had not previously mentioned it to her parents. Upon examination, the patient’s throat appeared normal. Based on a suspected differential diagnosis, a group A streptococcus (GAS) antibody titer was drawn; the results were positive. As a result, a formal diagnosis of PANDAS was made.

**What is Known about PANDAS**

The timing of PANDAS symptoms is variable. The onset of psychiatric symptoms in PANDAS is notoriously sudden. Frequently, caregivers note personality, behavioral and neurological changes, most notably, symptoms of OCD and tics, which can begin sometimes overnight (Pavone et al., 2020). The duration of PANDAS symptoms varies widely, ranging from a few weeks to life-long. The average timeframe for symptom manifestation is 12.2 weeks (Brown et al., 2017; Guido et al., 2019).

Characteristics of the specific neurological impairments also vary widely from the following categories: anxiety, agitation, mood disorder, depression, oppositional defiance disorder, attention-deficit hyperactivity disorder, hallucinations, memory/cognitive deficits, enuresis and sleep disturbances (Thienemann et al., 2017). However, universal key features are rapid onset of OCD and tics that cannot be attributed to another disorder (Thienemann et al., 2017).
GAS infections are the one major aggravating factor of PANDAS. GAS infections affect not only the initial, but reoccurring episodes of PANDAS as well. This occurs due to the fact that GAS infections reinvigorate an overactive immune response in susceptible individuals (Leon et al., 2018).

Alleviating factors that reduce the duration of PANDAS include antibiotics, cognitive behavioral therapy (CBT), eye movement desensitization and reprocessing (EMDR), non-steroidal anti-inflammatory drugs (NSAIDS), and intravenous immunoglobulin (IVIG) (Guido et al., 2019; Leon et al., 2018; Xu et al., 2021).

The severity of PANDAS symptoms and duration are as varied as the patients suffering from PANDAS themselves. Symptoms seen in the initial episode can vacillate from subtle to life altering depending on the individual’s immune response, how that response affects their brain, and what part of the brain the response targets. Moreover, while relapses are typically less severe and shorter in duration, relapses also fluctuate in severity based on how the patient reacts to a subsequent PANDAS trigger (i.e. GAS infection) (Leon et al., 2018)

**Pathophysiology**

PANDAS begins with an infection from GAS. As the child forms antibodies against GAS through the immune systems normal processes, those antibodies have the potential to trigger an autoimmune response. This autoimmune response is known as molecular mimicry, a process wherein antineural GAS antibodies attack normal healthy tissues of the body (Pabst & Subasic, 2020).

PANDAS is localized to the brain where it is believed to attack the cholinergic interneurons (CINs) in the striatum of the basal ganglia (Xu et al., 2021). CINs located within the basal ganglia have a direct role in behavior, executive decision making, motor control and
emotions (Lanciego et al., 2012). Antineural GAS antibodies attach themselves to the CINs, which in turn leads to a neuroinflammatory response within the basal ganglia pathways. These internal basal ganglionic structures are additionally inflicted by a neuroinflammatory response from the antineural GAS antibodies (Brown et al., 2017). This neuroinflammatory response leads to the signs and symptoms of OCD, tics, hallucinations, etc., commonly seen in PANDAS (Brown et al., 2017). With the complex and delicate nature of the brain, and the basal ganglia contained therein, it is easy to imagine why the symptomology seen in patients afflicted with PANDAS is so varied (Pabst & Subasic, 2020; Xu et al., 2021).

**Diagnosis**

A patient must meet five criteria to receive a clinical diagnosis of PANDAS. First, an association with a GAS infection or evidence of a recent infection indicated by a positive Anti-streptolysin O (ASO) or anti-DNase B test. Second, a patient must be between 3 years of age and puberty. Third, the onset of episodic behavioral changes is especially acute. Fourth, coexisting neurological impairments, such as tactile hallucinations, are noted. Fifth, concurrent, rapid onset of OCD and/or tics not attributed to another disorder are present (Thienemann et al., 2017).

Differential diagnoses for PANDAS include: pediatric acute-onset neuropsychiatric syndrome (PANS), Tourette syndrome, OCD, schizophrenia, and Sydenham chorea (SC) (Orefici et al., 2016). However, PANS can be ruled out by a negative ASO or anti-DNase B test. Tourette syndrome, OCD, and schizophrenia can be differentiated because when these disorders occur for reasons unrelated to PANDAS, they do not have the characteristic sudden onset observed in PANDAS (Orefici et al., 2016).

While PANDAS does not have a unique rating scale, the Pediatric Acute-onset Neuropsychiatric Syndrome (PANS) rating scale can be used to gauge symptom severity and
treatment response (See Appendix A). This scale would prove useful for the clinician to use as a symptom baseline measurement; then repeat at subsequent follow-up appointments as an objective means of quantifying the patient’s obsessions, compulsions and associated symptoms.

**Prognosis**

Leon et al. (2018) focused on ascertaining the prognosis of PANDAS by tracking how different treatment modalities affected the study participants. Thirty-three children who underwent various PANDAS treatments were evaluated. All the children were administered antibiotics. Most participants were prescribed penicillin, but a few were given either a macrolide, a cephalosporin, or a sulfonamide. Additionally, approximately 50% were randomly selected to be treated with IVIG, psychotherapy, and psychiatric medications (antidepressants, alpha adrenergics, antipsychotics, anxiolytics, and stimulants). At least one reoccurrence of PANDAS was noted in 24 of the 33 participants (Leon et al., 2018). Reoccurrence symptom duration data were only available for 12 of the 24 children. Of these 12, symptoms lasted anywhere from 1 day to as many as 24+ weeks. Reoccurrences were not necessarily linked to subsequent GAS infections. In fact, only 30% of the PANDAS reoccurrences were linked to either a subsequent GAS infection or new GAS exposure. Forty-seven percent of reoccurrences had no clear precipitant. At the end of the clinical trial, 88% of children no longer experienced clinically significant symptoms of PANDAS. This last statistic provides hope against PANDAS's potential to become a chronic burden (Leon et al., 2018).

Another study conducted in 2020 by Pabst and Subasic reported that a minority of children diagnosed with PANDAS experience the development of persistent neuropsychiatric symptoms, such as OCD and tics. Pabst and Subasic (2020) emphasized that the vast majority of
children diagnosed with PANDAS can expect a full recovery when given timely antibiotic
treatment.

Management

Pharmacological

One pharmacological management strategy is antibiotics. Evidence supports the use of
antibiotics in children meeting PANDAS criteria even when there has been an apparent absence
of GAS symptoms, such as “sore throat, dysphagia, pharyngeal erythema with or without
exudates, fever, and tender anterior cervical lymphadenopathy in the absence of cough or nasal
congestion” (Cooperstock et al., 2017, p. 596). In these cases, antibiotics can be given after a
positive result of an ASO or GAS antibody titer. This use of antibiotics is of important note
given prevailing prescribing recommendations for antibiotics where caution is emphasized, due
to antibiotic resistance (Hart & Phillips, 2020). The antibiotic most commonly prescribed to treat
PANDAS is Penicillin V, followed by macrolides, cephalosporins, and sulfonamides (see
Appendix B) (Leon et al., 2018).

Intravenous immunoglobulin (IVIG) is another pharmacological management strategy.
IVIG has demonstrated usefulness in combating the effects of PANDAS. Initial trials of IVIG in
PANDAS sufferers began in 1999 (Perlmutter et al., 1999). Perlmutter et al. (1999) was able to
demonstrate that IVIG treatments improved PANDAS-related OCD symptoms, anxiety, and
overall functioning after 1 month of initial treatment. Additionally, 82% of participants reported
either “much” or “very much” improvement in symptoms when comparing their pre-IVIG
treatment baseline with symptoms 1 year after treatment (Perlmutter et al., 1999). Similarly,
Williams et al. (2016) reported that 6 weeks post-IVIG treatment participants demonstrated a
23.9% improvement in symptoms. At 12 weeks, participants reported 50% improvement and
progress was maintained at 50% at 24 weeks post-IVIG treatments. Unfortunately, researchers in this study could not establish statistical significance compared to the placebo group. It should be noted that several of the participants were on concurrent antibiotic therapy at the time of the study (Williams et al., 2016).

Another pharmacological management strategy is nonsteroidal anti-inflammatory drugs (NSAIDs). NSAIDs have been shown to reduce the severity and duration of PANDAS symptoms, specifically OCD, tics, anxiety, and hallucinations (Brown et al., 2017; Spartz et al., 2017). NSAIDs target the neuroinflammatory response within the basal ganglia. The results of a 2017 study by Spartz et al. showed that 16 out of 52 (31%) participants had improvement in PANDAS symptom severity when the only change to the treatment plan was the addition of an NSAID. Furthermore, the Spartz et al. (2017) study found that 20 out of 57 (35%) participants had PANDAS symptom exacerbation when the only change to the treatment plan was the cessation of an NSAID. Another study by Brown et al. (2017) split participants into three groups during episodes of PANDAS reoccurrences: no NSAID treatment, prophylactic treatment, and early flare NSAID treatment. On average, non-NSAID treated PANDAS subjects experienced a longer exacerbation period lasting more than 12 weeks. In contrast, the average length of time of an exacerbation was 8 weeks amongst participants treated with both the prophylactic and early NSAID approaches. NSAIDs doses follow regimens used in many other autoimmune ailments treated by pediatric rheumatologists (see Appendix C) (Brown et al., 2017).

Selective serotonin reuptake inhibitors (SSRIs) are another pharmacological management strategy. SSRIs are effective treatment option for OCD, anxiety, and depression in pediatrics. When using an SSRI to treat PANDAS it is recommended that “clinicians must “Start Low and Go Slow!” as children with acute-onset neuropsychiatric disorders are exquisitely sensitive to
psychotropic medications” (Swedo et al., 2012, p. 6). The Thienemann et al. (2017) study also supports the use of SSRIs in the treatment of OCD in patients suffering with PANDAS. One limiting factor of the Thienemann et al. (2017) study, however, was that the sources used in support of SSRIs came from either clinical trials that studied children with OCD unrelated to PANDAS, and/or were older studies with dates ranging from 2001 to 2007 (Thienemann et al., 2017). Surprisingly, more recent studies have not been as optimistic in supporting this general psychiatric medicine mainstay of OCD, anxiety and depression treatment when applied to PANDAS patients. Hesselmark and Bejerot (2019) reported only two out of 24 (8%) participants showed any improvement in PANDAS-related psychiatric symptoms; and astonishingly six out of 24 (25%) of the participants reported having increased PANDAS-related psychiatric symptoms after SSRI treatment.

**Nonpharmacological**

Two nonpharmacologic treatments for psychiatric symptoms related to PANDAS include CBT and EMDR. CBT is most effective in the treatment of PANDAS when started early, and can be individualized to a patient’s prevailing symptoms such as OCD, tics, etc. (Thienemann et al., 2017). The goals of CBT in a child with PANDAS is to teach the child skills and give them tools to ameliorate OCD, anxiety and the litany of life stressors in the short- and long-term (Thienemann et al., 2017).

Management of PANDAs symptoms are most effective when CBT is paired with antibiotics or IVIG therapies (Leon, et al., 2018). One study demonstrated that after 24 weeks of CBT, 75% of patients exhibited only mild symptoms and 18% were able to discontinue therapy altogether. Eighty-eight percent of patients who received antibiotics and IVIG showed near-full to full remission of their PANDAS symptoms after 3 years of treatment (Leon, et al., 2018).
EMDR is a psychotherapy commonly used in the treatment of Post-Traumatic Stress Disorder (PTSD). One case study by Guido et al. (2019), demonstrated promising results with EMDR on an 11-year-old subject diagnosed with PANDAS. Antibiotic treatment delivered during 2016 and 2017 showed only mild improvement in the patient’s OCD and tics, with frequent exacerbations after repeated GAS infections. However, after an eight-stage EMDR treatment series, the child experienced a reduction in motor and vocal tics, as well as OCD symptoms by more than 50% (Guido et al., 2019). These initial results are promising, but more research needs to be conducted to determine the effectiveness of EMDR in the treatment of PANDAS.

**Patient and Caregiver Education**

Caregivers and patients should receive education on proper household and hand hygiene techniques to mitigate the spread and the reinfection of GAS whenever possible. Additionally, practitioners should provide education to caregivers and patients regarding the symptomology of PANDAS and how/when to report behavioral changes, especially if the child afflicted with PANDAS does not demonstrate symptom resolution within a few days. Caregivers should also receive education regarding when symptoms of GAS are noted in a child who is in recovery and when the siblings of a recovered PANDAS patient show symptoms of GAS, as these events may trigger a reoccurrence of PANDAS (Pabst & Subasic, 2020).

Caregivers and patients should also be instructed on the importance of taking medication as prescribed, as well as consistently adhering to the nonpharmacological treatment plan (i.e., CBT). When applicable, caregivers should understand that the benefits of long-term antibiotic therapy can mitigate future PANDAS exacerbations. Education on the rationale for use
probiotics are recommended in tandem with long-term antibiotic use to guard against opportunistic gastrointestinal bacterial infections (Pabst & Subasic, 2020).

**Resources**

Websites such as, PANDAS Physicians Network (See Appendix D) and the PANDAS Network (See Appendix D), are two websites that can link providers and caregivers to local support in their area. Caregivers should be encouraged to be open with their child’s school so that educators can also be aware of the signs and symptoms of a PANDAS exacerbation (i.e., GAS exposure, behavioral changes unique to the classroom environment, and potential for academic decline). Additionally, the school may be able to make accommodations for the child with PANDAS. There are also several websites that address OCD and tic disorders located in Appendix D. These websites provide a plethora of resources for individuals suffering from PANDAS, OCD, and tic disorders and their family members.

**Conclusion**

Healthcare providers treating pediatric patients should be aware of the possible diagnosis of PANDAS in children who develop sudden OCD and tics following a GAS infection. Pharmacological and nonpharmacologic treatment strategies have proven effective in the management of PANDAS. Providers appropriately screening for and managing PANDAS will ultimately promote an increased quality of life in these patients and their families.


References


Journal of Child and Adolescent Psychopharmacology, 29(8), 634–641.
https://doi.org/10.1089/cap.2018.0141

https://doi.org/10.1101/cshperspect.a009621


http://www.ncbi.nlm.nih.gov/books/NBK333433/


Journal of Child and Adolescent Psychopharmacology, 30(9), 567–571.

https://doi.org/10.1089/cap.2020.0050


https://doi.org/10.1089/cap.2016.0179


https://doi.org/10.4172/2161-0665.1000113


Appendix A

PANS Rating Scale

(Pans_rating_scale-Gail_bernstein_md_uminn___tanya_murphy_usf.Pdf., 2021.)

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### Appendix B

**Antibiotic Prescribing Information**

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<th>Route</th>
<th>Duration</th>
<th>Dose</th>
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<tbody>
<tr>
<td>- Penicillin V</td>
<td>PO</td>
<td>10 Days</td>
<td>250 mg/dose bid or TID</td>
</tr>
<tr>
<td>- Amoxicillin</td>
<td>PO</td>
<td>10 Days</td>
<td>50 mg/kg once daily, maximum 1 g</td>
</tr>
<tr>
<td>- Benzathine penicillin G</td>
<td>IM</td>
<td>Once</td>
<td>≤27 kg (60 lbs): 600,000 U &gt;27 kg (60 lbs): 1.2 M U</td>
</tr>
<tr>
<td>- Azithromycin</td>
<td>PO</td>
<td>5 Days</td>
<td>12 mg/kg once, max 500 mg, then 6 mg/kg</td>
</tr>
<tr>
<td>- Clarithromycin</td>
<td>PO</td>
<td>10 Days</td>
<td>daily, max 250 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.5 mg/kg/dose bid, max 250 mg/dose</td>
</tr>
<tr>
<td>- Cephalexin</td>
<td>PO</td>
<td>10 Days</td>
<td>20 mg/kg/dose bid, max 500 mg/dose</td>
</tr>
<tr>
<td>- Cefadroxil</td>
<td>PO</td>
<td>10 Days</td>
<td>30 mg/kg once daily, maximum 1 g</td>
</tr>
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(Cooperstock et al., 2017)
Appendix C

NSAID Dosing

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<tr>
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<tr>
<td>Naproxen</td>
<td>10mg/kg every 12 hours (maximum: 500 mg/dose)</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>10 mg/kg every 6–8 hours (maximum: 600 mg/dose)</td>
</tr>
<tr>
<td>Sulindac</td>
<td>2–4 mg/kg every 12 hours (maximum: 6 mg/kg/day)</td>
</tr>
<tr>
<td>Celecoxib</td>
<td>50–100 mg twice a day</td>
</tr>
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(Brown et al., 2017)
Appendix D

Resources

PANDAS Physicians Network

http://www.pandasppn.org/parent-information

PANDAS Network

https://pandasnetwork.org/resources/parent-resources/

OCD and Tic Disorder Websites

National Institute of Mental Health: obsessive-compulsive disorder

https://www.nimh.nih.gov/health/topics/obsessive-compulsive-disorder-ocd

International OCD Foundation Anxiety

https://iocdf.org/

Depression Association of America

https://adaa.org/understanding-anxiety/obsessive-compulsive-disorder-ocd

American Academy of Child & Adolescent Psychiatry: tic disorders


Tourette Association of America

https://tourette.org/