

A Discussion of PANDAS in Modern Psychology

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Abstract

The goal of this study is to examine the place of pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection (PANDAS) in modern psychology. A diagnosis of PANDAS is reached when an individual experiences an onset in or an increase in the symptoms of obsessive-compulsive disorder (OCD) and/or Tourette syndrome (TS). To determine how the medical community views PANDAS this study will first lay out the definitions and symptoms of OCD and TS. Then the study will examine the specific diagnostic criteria and history of PANDAS in psychology. This examination will include the evaluation of a variety of different case studies and research experiments related to the diagnosis of PANDAS. The study will finally comment upon the implications of the medical research and PANDAS in relation to psychology as a field of study. The goal of this study is to examine the role and validity of PANDAS within the current medical community. Furthermore, the goal of this study is to suggest the validity of PANDAS as a diagnosis relating to a specified type of OCD and TS and their relation to a strep infection.

Last year, a boy at my school (K-12) named Mark (name changed to ensure confidentiality) suddenly developed obsessive-compulsive disorder (OCD). His OCD became so severe that he had to take time off of school and fly across the country to visit a psychologist who has a high success rate helping patients control their OCD. When reviewing his case, the psychologist suggested that Mark's sudden symptoms might be the result of a pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection (PANDAS) (Pavone, Parano, Rizzo & Trifiletti, 2006). Mark had recently developed strep throat, which normally is normally "benign and self-limited" (Pavone et al., 2006) but in some children, changes in neurological or psychiatric sequelae may persist. This persistence can accompany the onset of OCD or tics.

PANDAS is controversial. It has been defined as a syndrome in which motor and/or vocal tics and/or OCD are exacerbated in relation to a streptococcal infection (GABHS infection) (Pavone et al., 2006). In short, PANDAS is a form of OCD or Tourette syndrome (TS), which appears in correlation with a strep infection. However, due to controversial laboratory data and a variety of possible confounding variables, psychologists have questioned whether or not PANDAS even exists as a disorder (Hounie, Mercadante, Alvarenga, Sampaio, Taub, & Miguel, 2006).

In this study, the assertion will be made that PANDAS is a real disorder in which the onset of OCD and/or TS is the result of a streptococcal infection. To do this, first the study will discuss OCD and TS in relation to their definitions, symptoms, and comorbidity. Then the study will focus on specific research relating to PANDAS and why this confirms the correlation between streptococcal infection and an onset of OCD and/or TS.

Obsessive-Compulsive Disorder (OCD)

Definition and Characteristics

OCD is an anxiety disorder (DeVeough-Geiss, 1993) that is characterized by the

patient experiencing the presence of obsessions and compulsions. According to Psychiatric Annals, obsessions are recurring, persistent thoughts, images, or impulses, which enter awareness and cause anxiety or distress within the patient (Hounie et al., 2006). Some common obsessions in patients would be persistent thoughts/worries about safety, contamination, or symmetry (Greenberg, 2013). Compulsions are repeated behaviors in response to an obsession or a strict code of rules with the goal of reducing or eliminating distress or something dreaded (Hounie et al., 2006). Some common compulsions include cleaning, counting, checking, and arranging objects (Greenberg, 2013). People diagnosed with OCD excessively monitor their own thoughts and actions to avoid the loss of control (whether imagined or real) (Reuven-Magril, Dar, & Liberman, 2008).

Figure 1 demonstrates that the average onset age of OCD is 19 years old and that is the about a 1.6% prevalence of OCD in the adult population in the United States of America.

Comorbidity

OCD has comorbidity with a variety of other psychological disorders. Unipolar depression and anxiety disorders are the two most common comorbid conditions for OCD (Franklin & Foa, 2011). At least three quarters of patients diagnosed with OCD will experience at least on major depressive episode in their lifetime (DeVeugh-Geiss, 1993). Social phobia is a common anxiety disorder experienced in conjunction with OCD (DeVeugh-Geiss, 1993). Table 1 indicates some of the most common comorbidity rates relating to OCD.

There is a known comorbidity between patients with OCD and patients with Tourette syndrome (TS), which is a specific form of tics. This association is based off of the involvement of the dopaminergic system (Hounie et al., 2006). There is also a larger frequency of OCD characteristics found when examining TS probands and vice versa (Hounie et al., 2006). Comorbidity suggests that there may be a deeper connection between

the syndromes or disorders and as a result, the comorbidity between TS and OCD is an important factor to consider when reflecting upon the significance of PANDAS in inducing OCD and/or TS.

Tourette Syndrome (TS)

Definition and Characteristics

TS is a disorder which inhibits a patient in the form of motor and vocal tics (Mateševac, 1991). TS is a neurodevelopmental disorder in which tics are associated with sensory symptoms (Rajagopal & Cavanna, 2014). Tics are defined as “sudden, recurrent, non-rhythmic movements...or vocalizations...which are characteristically preceded by specific urges” (Rajagopal & Cavanna, 2014). Table 2 indicates some of the common forms of tics, which include blinking, grimacing, grunting, or sniffing (Rajagopal & Cavanna, 2014).

About 200,000 Americans have severe TS and it is estimated that one in 100 experience milder symptoms such as motor or vocal tics (National Institute of Neurological Disorders and Stroke [NINDS], 2012).

Comorbidity

About 90% of patients with TS exhibit symptoms of another behavioral problem (Rajagopal & Cavanna, 2014). The comorbid behaviors that accompany TS often cause more difficulties than the tics themselves. The two main comorbid behaviors associated with TS are attention deficit hyperactivity disorder (ADHD), and OCD (NINDS, 2012). Many times, people with TS also exhibit characteristics related to depression or anxiety disorders (NINDS, 2012).

Table 3 shows the data of an experiment which asked participants to take the Yale Global Tic Severity Scale (YGTSS) to assess their tic severity based on number, frequency, intensity, complexity and interference and also to assess the severity of their OCD symptoms

using the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Rajagopal & Cavanna, 2014). The results of this study, as expressed in Table 3, draw interesting connections between the symptoms of OCD and the symptoms of TS. Since both can be induced by a strep infection this comorbidity further suggests the possibility of a relationship between TS and OCD.

Pediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcal Infection (PANDAS)

History

The concept of PANDAS has been the object of much discussion since 1996 when the acronym was first used in the literature (Pavone et al., 2006). Since PANDAS was first introduced, over 75 articles have been written exploring the topic (Pavone et al., 2006).

Definition and Characteristics

PANDAS is a syndrome in which tics (motor and/or vocal) and/or obsessive compulsive disorder consistently worsen in correlation with a group A β -hemolytic streptococcal infection (Pavone et al., 2006). PANDAS constitutes a subset of children with tics, Tourette syndrome, and obsessive-compulsive disorder. PANDAS is different from a normal onset of OCD or TS because of its sudden onset and/or exacerbated symptoms in conjunction with a recent bout of strep throat.

It is theorized that an antibody produced to combat strep throat bacteria may sometimes accidentally act on a brain enzyme (National Institute of Mental Health [NIMH], 2006). This action disrupts vital communications between neurons in the brain which then, in turn, triggers OCD or TS (NIMH, 2006). It is estimated that about 5-15% of children with OCD or TS exhibit exacerbated symptoms due to PANDAS (Bower, 2000).

Diagnostic Criteria

Since PANDAS is relatively new in the world of psychology, the diagnostic criterion is critical in defining a typical case and subsequently categorizing exceptions as abnormal cases or overlaps. Currently the criteria for diagnosing PANDAS relates to OCD and TS, and although some psychologists are researching PANDAS variants, these variations have not yet been well documented or defined (Pavone et al., 2006).

Currently, the five clinical criteria used when diagnosing PANDAS are as follows: 1. Presence of OCD or TS in a patient after they have recently had a strep throat infection. 2. Prepubertal symptom onset, which means that PANDAS is a pediatric condition. 3. Sudden onset or abrupt exacerbations due to a chemical alteration, which occurs as a result of the strep infection. 4. Association with neurological abnormalities during exacerbations (adventitious movements or motor hyperactivity) 5. A temporal association between symptom exacerbations and GABHS infections (Hounie et al., 2006). The diagnostic criteria for PANDAS is further flushed out in Table 4.

Debate about PANDAS

Criticism relating to the existence of PANDAS. Although in recent years PANDAS has become more widely accepted in the medical community, many are still skeptical of the link between a sudden onset of OCD or TS and A β -hemolytic streptococcal infection (Pavone et al., 2006). TS and OCD can be suddenly exacerbated without any connection whatsoever to strep. So some psychologists do not think that the link is a valid connection, but rather that sudden onset of TS and OCD occurs without conjunction to strep (Pavone et al., 2006).

One of the major challenges of PANDAS is that there are difficulties when analyzing symptoms in a clinical setting and looking at infectious markers in patients (Macerollo & Martino, 2013). Because of this, many psychologists worry that diagnoses of PANDAS are made erroneously within the community (Macerollo & Martino, 2013). It has been argued

that when PANDAS occurs, there is an increase in two antibody titers (ASO and anti-deoxyribonuclease B) within the patient. Unfortunately, these titers are difficult to detect and difficult to monitor since they often remain elevated for up to a year after the infection (Macerollo & Martino, 2013). Therefore, it could be unclear if there was an actual chronic elevation in the antibody titers or if they were elevated at all or if they were only elevated as a result of the residual effect of the infection. Due to this variability, some psychologists argue that there are too many confounding variables and uncontrolled variables to confirm the existence of PANDAS.

There have been a variety of different studies done trying to determine the link between strep and an onset of OCD or TS. In one of those studies, PANDAS cases had a slightly greater rate of strep-related symptom exacerbation, but the majority of all of these symptom exacerbations were not related to strep at all (Macerollo & Martino, 2013). This again raised concerns about the validity of PANDAS as a diagnosis.

Another concern some medical professionals raise is the fact that many children get strep throat and do not have PANDAS. In one longitudinal study, researchers concluded that they could find no greater of a chance of association with strep infections and exacerbated symptoms of OCD or TS (Luo et al., 2004).

However, in the conclusion section of that study, the researchers admitted that even though their study had not revealed a solid link between strep and OCD or TS, therefore undermining the validity of PANDAS, they could not conclude definitively that there was no connection (Luo et al., 2004).

Support for the existence of PANDAS. Even though many members of the medical community are skeptical about the prevalence or even the existence of PANDAS, there are also many psychologists who have researched and diagnosed PANDAS with full confidence in its existence.

In the early 1900s when PANDAS was first being assessed as a condition, Swedo and Leonard were two researches who suggested a relationship between tics, OCD, and streptococcal infection (Pavone et al., 2006). They based this assertion on their evaluation of four young boys when all experienced severe and abrupt symptoms of tics and/or OCD shortly after they had a streptococcal infection (Pavone et al., 2006).

Swedo continued her research related to PANDAS with the assistance of Kirvan and Cunningham. In 2006 they reported on their discoveries relating to the blood samples of patients with PANDAS. In this study, three-fourths of the blood samples of participants with PANDAS contained strep antibodies (NIMH, 2006). Only about 23% of samples from patients without PANDAS symptoms (NIMH, 2006). Another interesting finding of the study was that the PANDAS patients' cerebrospinal fluid (CSF), (a fluid which bathes the brain and reflects brain activity) contained elevated levels of the enzyme that is suggested as the trigger for strep (NIMH, 2006). Patients without PANDAS had none or almost no CSF (NIMH, 2006). The results of Swedo's research suggest that there is a component of strep throat, which can incorrectly induce in patients the symptoms of OCD and/or TS.

Another more recent experiment was in 2002 when a study was conducted over a three year time period in which 12 children with PANDAS were studied. Each exhibited a series of OCD behaviors during the time when they also exhibited the symptoms of strep throat (Murphy & Pichichero, 2002). When the researchers performed serologic tests, there was a high concentration of antideoxyribonuclease antibody titers (Murphy & Pichichero, 2002). One of the most interesting aspects of this case study is that when the participants were treated with antibiotics, the symptoms of the OCD disappeared with the strep (Murphy & Pichichero, 2002). A portion of the participant did exhibit recurrent symptoms of OCD but once again these symptoms were directly related to a bout of strep throat and could be suppressed with antibiotics (Murphy & Pichichero, 2002).

A case study about an 11 year old boy diagnosed with PANDAS is similar to the story of Mark described at the beginning of this study. In this case study, the boy was diagnosed with PANDAS and the normal treatment of antibiotics did not reduce the symptoms of his sudden onset OCD (Ayaydin & Abali, 2010). As a result, he was given Therapeutic Plasma Exchange and Intravenous Immunoglobulin (IVIG) and this treatment was successful in reducing the symptoms of his OCD (Ayaydin & Abali, 2010). IVIG treatment is not recommended as a first course of action but is successful in reducing the symptoms in children with PANDAS in extreme cases.

Overall, since PANDAS first became a topic of discussion in the 1900s there has been much research done and many case studies, which strongly indicate that PANDAS is a real medical concern within the psychological community.

Discussion

Interpretation

This study has examined the validity of the existence of PANDAS within the medical community. First, by creating a solid understanding of the symptoms and diagnoses of OCD and TS. Second, by explaining the high rates of comorbidity between TS and OCD, which may suggest that there is a deeper chemical or physiological connection between the two. Finally, this study delved into the specifics of what PANDAS is and the mechanisms that cause it. From there, a variety of case studies and research were examined relating to the medical arguments about the uncertainty surrounding PANDAS.

Although there is still debate in the medical community it appears that in the last few years more and more psychologists have acknowledge the diagnosis of PANDAS based on the diagnostic criteria stated above. Now researchers have turned their attentions to the various uncertainties as to the specific mechanism that causes PANDAS especially related to how the antibodies in strep cross the blood brain barrier (NIMH, 2006). More research is also

being done into medical conditions that may be called “PANDAS variants” (Pavone et al., 2006). Finally, more research is being done related to how to best treat PANDAS especially since this is a pediatric condition.

For those in the medical community who still are unsure about the validity of PANDAS, they may never be convinced. This is because it is true that OCD and TS can have a sudden unprompted onset. It is also true that many children do get strep throat and see no repercussions before, during, or after the infection or treatment. There are even some research studies that suggest that the data linking strep and OCD and/or TS is null. However, with the solidification of the diagnostic criteria for PANDAS and an increase in awareness surrounding the condition, it seems that the validity of PANDAS has been tested and affirmed on many fronts within the medical community.

Conclusions

This study examining the validity of PANDAS cannot draw any definite conclusions, but it can show a variety of data and increased acceptance rate of PANDAS among psychologists. It also presented the opposing side of the issue so that the debate surrounding PANDAS can be fairly represented.

Reliability and Validity

One of the major concerns with the acceptance of PANDAS is the inability to always predict or replicate the results of experiments and case studies within a research or lab setting. Therefore, the reliability of the PANDAS research is not perfect, but in recent years reliability has increased as researchers have learned what antibodies to focus on in relation to PANDAS. The validity of PANDAS has also increased due to the diagnostic requirements and disorder clarifications in recent years. A limitation of this study is that no new research was done, but instead the research and case studies of other psychologists were used to formulate an understanding of PANDAS.

Implications

The saga of PANDAS in the medical community represents a larger issue of innovative research being viewed through skeptical lenses by the medical community. Perhaps this comes as the result of previous errors in research and the medical field's desire to vet the validity of a diagnosis or procedure before accepting it as part of mainstream medicine. While this healthy skepticism is important, it may also overly complicate the path for new research to become indoctrination into medical dogma.

Further Research

In response to this study, more research into a variety of case studies and experiments related to PANDAS should be undertaken. It would also be beneficial to produce new research relating to the specific increased antibody levels in the brain of patients with PANDAS. Possibly a new avenue of research relating to PANDAS would also be looking at the differences between children and adults, because currently PANDAS is a pediatric diagnosis. It would be interesting to explore first of all why this is psychologically and second of all to examine if the connection between a strep infection and the sudden onset of OCD and/or TS could have even broader indications for adulthood that the medical community has yet to discover.

Conclusion

Eventually Mark's symptoms of OCD dissipated and he was able to return to my school. He still flies to California periodically to visit with the psychologist who diagnosed him with PANDAS. Although PANDAS is a recently new diagnosis in the medical community, this study has demonstrated why it is now becoming widely accepted and utilized as an effective diagnosis relating to a sudden onset or exacerbation of OCD and/or TS after or during an individual's experience with A β -hemolytic streptococcal infection.

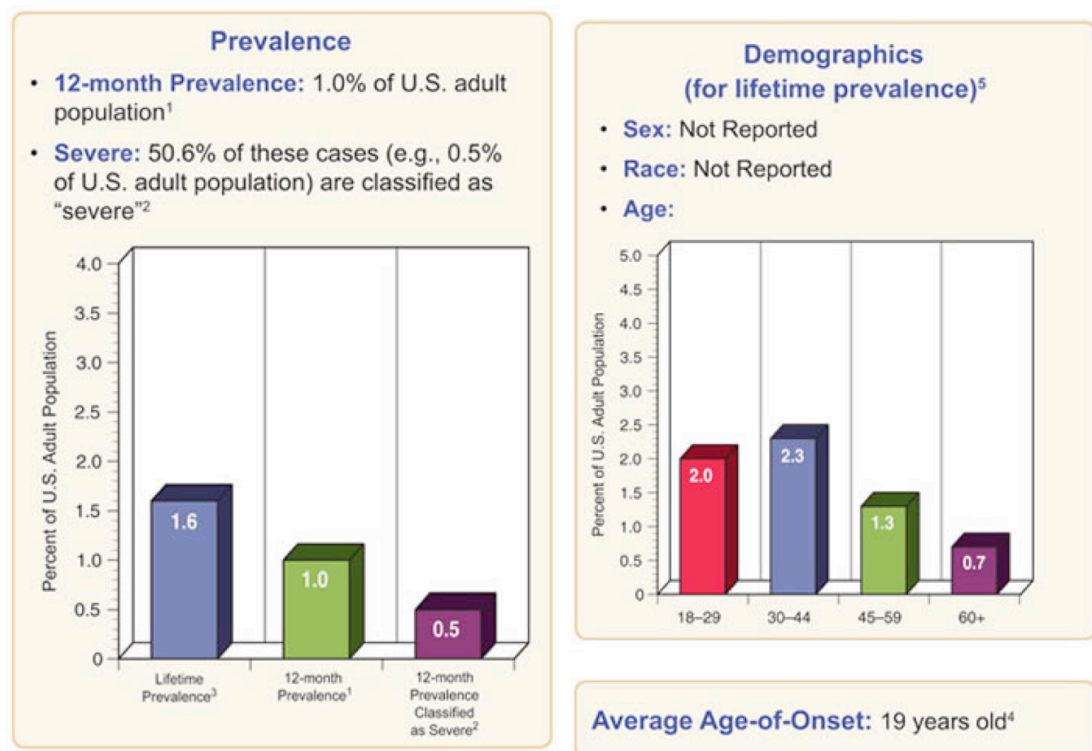
Figure 1**Obsessive-Compulsive Disorder (OCD)**

Figure 1 depicts the rates of OCD within the population in the USA.

(http://www.nimh.nih.gov/statistics/1ocd_adult.shtml)

Table 1

TABLE 4.
Comorbidity Rates for OCPD Occurring Together with DSM-IV Axis I Disorders

<i>Author (Year)</i>	<i>Axis I Disorder</i>	<i>Percentage with OCPD</i>
Pinto et al (2006) ⁹⁷	OCD	25%
Samuels et al (2000) ⁸⁵		32%
Rossi et al (2001) ⁸³	Major depressive disorder	30.8%
Rossi et al (2001) ⁸³	Bipolar affective disorder	30.4%
Devanand et al (2000) ⁴¹	Dysthymic disorder	17.1%
Nilsson et al (1999) ⁹⁸	Anorexia nervosa	20%
Anderluh et al (2003) ⁹⁹		61%
Grilo and McGlashan (2000) ¹⁰⁰	Bulimia	25.7%
Karwautz et al (2003) ¹⁰¹		26%
Albert et al (2004) ⁸⁶	Panic disorder	17.1%

OCPD=obsessive-compulsive personality disorder; *DSM-IV*=*Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition*; OCD=obsessive-compulsive disorder.

Fineberg NA, Sharma P, Sivakumaran T, Sahakian B, Chamberlain S. *CNS Spectr.* Vol 12, No 6. 2007.

Table 1 is about comorbidity with OCD and other disorders.

(<http://www.cnsspectrums.com/asp/articleDetail.aspx?articleid=1091>)

Table 2

TABLE 1 Tic types and complexity

Type	Complexity	
	Simple	Complex
Motor	• Isolated to muscle groups – Face and neck • Eye blink • Eye roll • Neck jerk • Jaw thrust – Abdomen tightening – Extremities • Tightening buttocks or thighs • Thrusting arm • Rapid executions, often in repeated bouts • Do not appear to mimic an intended movement	• May involve multiple muscle groups in sequence or in unison • Sometimes slow or sustained • May mimic an intended action • Mimicking movements of others (echopraxia) • Gestures (waving, reaching) • Still postures (statue-like) • Vulgar movements (touching crotch, giving “the finger”)
Vocal	• Noises from the mouth, nose, and throat – Grunt – Chirp – Squeak – Cough – Sniff – Snort – Raspberry • Rapid executions, often in repeated bouts • Do not appear to mimic spoken language	• Noises that mimic spoken language • Mimicking noises or language of others (echolalia) • Repeating language phonemes • Blurting words or phrases without intention to communicate • Unintended obscene or offensive statement (coprolalia)

From American Psychiatric Association.²

Table 2 is a list of common tics.

(http://images.alfresco.advanstar.com/alfresco_images/HealthCare/2013/04/01/751a9879-a350-4ba9-91c2-ddeb7994f633/cntped0413_Feature%202_Table%201.jpg)

Table 3

Neurol Sci

Table 1 Correlations between individual PUTS item score and MOVES subscores (Spearman's rho)	PUTS items	MOVES subscales				
		Motor tics	Vocal tics	Complex tics ^a	Compulsions	Obsessions
PUTS Premonitory Urges for Tics Scale, MOVES Motor tic, Obsessions and compulsions, Vocal tic Evaluation Survey	Item 1: itchy insides	0.295*	0.356*	0.211	0.305*	0.253
	Item 2: pressure in brain or body	0.233	0.302*	0.201	0.312*	0.371*
	Item 3: 'wound up' or inner tension	0.221	0.199	0.201	0.306*	0.238
	Item 4: something not 'just right'	0.193	0.161	0.084	0.297*	0.240
	Item 5: something not complete	0.229	0.227	0.224	0.448*	0.287*
	Item 6: energy in the body	0.207	0.233	0.258	0.341*	0.330
	Item 7: urges all the time before tic	0.149	0.175	0.064	0.233	0.230
	Item 8: urges for every tic	0.103	0.162	0.091	0.222	0.186
	Item 9: relief after tic expression	−0.006	−0.009	0.053	0.053	0.065
	Item 10: tic suppressibility	−0.180	−0.021	0.073	−0.084	−0.053

* Statistically significant following Holm's sequential Bonferroni correction for multiple comparisons

^a Complex tics: echolalia, echopraxia, copropraxia, palilalia

Table 3 shows data from an experiment about the relationship between OCD and tics.

(http://download.springer.com/static/pdf/29/art%253A10.1007%252Fs10072-014-1706-8.pdf?auth66=1396752660_581726e0ca5f6d95ffc1a70ef936339c&ext=.pdf)

Table 4

PANDAS
1. Presence of OCD and/or a tic disorder The patient must meet lifetime diagnostic criteria (DSM-III-R or DSM-IV) for OCD or a tic disorder. 2. Pediatric onset Symptoms of the disorder first become evident between 3 years of age and the beginning of puberty. 3. Episodic course of symptom severity Clinical course is characterized by the abrupt onset of symptoms or by dramatic symptom exacerbations. Often, the onset of a specific symptom exacerbation can be assigned to a particular day or week, at which time the symptoms seemed to “explode” in severity. Symptoms usually decrease significantly between episodes and occasionally resolve completely between exacerbations.¹ 4. Association with Streptococcal infection Symptom exacerbations must be temporally related to Streptococcal infection, i.e., associated with positive throat culture and/or rising anti-streptococcal antibody titers.² 5. Association with neurological abnormalities During symptom exacerbations, patients will have abnormal results on neurological examination. Motoric hyperactivity and adventitious movements (including choreiform movements) are particularly common.³

Table 4 outlines the diagnostic criteria for a PANDAS diagnosis.
(Pediatric Autoimmune Neuropsychiatric Disorders Associated with
Streptococcal Infections (PANDAS): An Evolving Concept)

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