



# Proverb Comprehension in Primary Progressive Aphasia

## Primer Progresif Afazide Atasözlerini Anlama ve Kavrama

İbrahim Can Yaşa<sup>1</sup>, Fenise Selin Karalı<sup>2</sup>

<sup>1</sup>Bahçeşehir University, Faculty of Health Sciences, Department of Speech and Language Therapy, Istanbul, Turkey  
<sup>2</sup>Biruni University, Faculty of Health Sciences, Department of Speech and Language Therapy (English), Istanbul, Turkey

### Abstract

**Aim:** Proverb comprehension was tested in 22 patients with primary progressive aphasia utilizing idiom explanation task. The aim of this study was to determine proverb comprehension in PPA patients using the Proverb Scale.

**Material and Method:** To assess the participants, Montreal Cognitive Assessment Scale, the Pyramid and Palm Trees test and the Proverb Scale were used.

**Results:** As a result of statistical analysis, there was a significantly difference between svPPA and lvPPA regarding idiom comprehension scores, the Pyramid and Palm Trees Test Scores and MoCA scores.

**Conclusion:** It is an important study to understand how the abstraction in PPA works regarding the language. In PPA subtypes, semantic memory, proverb and MoCA scores were significantly different between logopenic and semantic variants. Although MoCA and proverb comprehension were correlated in svPPA, no correlation was found in lvPPA. With similar studies in the field, it would be possible to better explain the effects of PPA, a disorder characterized by language disorders.

**Keywords:** Proverb, primary progressive aphasia, semantic, logopenic

### Öz

**Amaç:** Atasözü açıklama görevi kullanılarak primer progresif afazili 22 vakada atasözlerini anlama ve kavrama becerileri değerlendirildi. Bu çalışmanın amacı, soyutlama, anlama ve kavrama ile ilgili ölçek ve testler kullanarak PPA hastalarında atasözü anlama düzeylerini belirlemektir.

**Gereç ve Yöntem:** Katılımcıları değerlendirmek için Montreal Bilişsel Değerlendirme Ölçeği, Piramit ve Palmiye Ağaçları testi ve Atasözü Ölçeği kullanıldı.

**Bulgular:** İstatistiksel analiz sonucunda atasözü anlama puanları, Piramit ve Palmiye Ağaçları Test Puanları ve MoCA puanları açısından svPPA ve lvPPA arasında anlamlı bir fark bulunmuştur.

**Sonuç:** PPA'daki soyutlamanın dil açısından nasıl çalıştığını anlamak için önemli bir çalışmadır. PPA alt tiplerinde semantik bellek, atasözlerini anlama ve MoCA skorları anlamlı olarak logopenik ve semantik varyantlar arasında değişiklik göstermektedir. svPPA'da MoCA ve atasözü anlama arasında bir korelasyon olmasına rağmen lvPPA'da herhangi bir korelasyon bulunamamıştır. Bu gibi çalışmalar sayesinde dildeki bozulmalar ile karakterize bir bozukluk olan PPA'nın etkilerini daha iyi açıklamak mümkün olabilecektir.

**Anahtar Kelimeler:** Atasözü, primer progresif afazi, semantik, logopenik



## INTRODUCTION

Primary progressive aphasia (PPA) is a clinical syndrome characterized by the gradual decline of language skills.<sup>[1,2]</sup> Although additional cognitive symptoms and non-linguistic disorders may occur in the advanced stages of the disease, the resulting impairments must be predominately linguistic for at least two years to qualify as PPA. PPA can be classified into 3 subtypes: semantic variant (svPPA), nonfluent variant (nfvPPA) and logopenic variant (lvPPA).<sup>[3]</sup>

Patients with svPPA exhibit well-structured, well-articulated speech that lacks of all meaning. Common symptoms include a lack of precise expression and an increased difficulty locating words, especially nouns (also known as a "loss of memory for names"). Patients with nfvPPA typically have labored, slow, hesitant, and jumbled speech. Common speech sound problems include 'slurring' or mispronouncing words can also occur. In the lvPPA, word-finding difficulties and conversational lapses are present.<sup>[4]</sup>

The use of figurative expressions, whose meaning differs from the literal meaning of their component terms, is an aspect of linguistic communication; these expressions include proverbs, hyperboles, metaphors, and idioms. Idioms are among the most prevalent figurative language forms. They are typically described as frozen phrases whose meanings are explicitly stipulated in a mental lexicon, and the speaker's meaning cannot be deduced from an examination of the words' typical meanings.<sup>[5]</sup> These expressions are distinguished by a semantic eccentricity: their meaning is not a direct function of the meanings of their constituent words. For instance, the meaning "die suddenly" is not produced when the meanings of the words "kick," "the," and "bucket" are constructed according to the syntactic relations that exist between them. According to Glucksberg and McGlone, a person must be familiar with the convention in order to appropriately interpret it.<sup>[6]</sup>

When compared to controls, patients with Alzheimer's disease (AD) were impaired in interpreting abstract meanings: when presented with alternative interpretations of familiar phrases, they chose concrete responses. As for Kempler, Van Lancker, and Read it implies that they were using lexical (single word), referential meaning to interpret the phrases.<sup>[7]</sup> It has also been shown that interpreting proverbs, which is a method of assessing abstraction skills, is associated with other executive functions such as planning, problem solving, fluency and set changing in patients with frontal lobe dysfunction.<sup>[8,9]</sup>

Yamaguchi et al. observed that as dementia severity increased in patients, scores for understanding proverbs decreased and confabulation increased.<sup>[10]</sup> Successful interpretation of proverbs requires both basic language skills, that is, one's ability to understand the meanings of words and express their answers, and the ability to integrate the meanings of words into abstract principles or concepts in a coherent way, that is, high-level executive functions.<sup>[11]</sup>

Even in the early stages, patients with Alzheimer's disease have impaired executive functions.<sup>[12]</sup> Given that Alzheimer's disease patients with normal propositional language

comprehension have been found to have impaired figurative language comprehension, we decided to investigate idiom comprehension in patients with primary progressive aphasia, which is type of a dementia.<sup>[13,14]</sup>

As PPA is relatively focal degeneration of the brain systems that govern language, it is important to explore how abstract thinking is affected. Therefore, the main goal of this study was to assess whether the comprehension of idiomatic expressions in PPA is affected. In light of this literature, we seek answers to the following research questions:

1. How are the group scores for the Proverb Scale, PPTT and MoCA?
2. Is there a difference between svPPA and lvPPA groups regarding the Proverb Scale, PPTT and MoCA scores?
3. Is there a correlation among MoCA, the Phrase Comprehension test and PPTT in svPPA?
4. Is there a correlation among MoCA, the Phrase Comprehension test and PPTT in lvPPA?

## MATERIAL AND METHOD

### Design

This study is a cross-sectional descriptive study to examine the idiom comprehension of patients with PPA. The study was carried out with the permission of Bahçeşehir University Research and Publication Ethics Committee (Date: 27/04/2023, Decision No:E-85646034-604.02.02-59908). Informed consent was obtained from all participants. The time period for the collecting of the data was from May, 2023 through June, 2023. Participants were selected from individuals willing to volunteer to take part in the study.

### Participants

The diagnosis of PPA is determined by the criteria recommended by Mesulam.<sup>[1,2]</sup> Further analysis for subtypes of PPA, Gorno-Tempini et al. criteria was used.<sup>[15]</sup> As for Gorno-Tempini et al., PPA can be classified into one of three types at three different levels: clinical, imaging-supported, or confirmed pathologic diagnosis. When a case exhibits speech and language characteristics of a certain variation, clinical diagnosis is made. **Table 1.** shows the criteria for PPA by Mesulam.

**Table 1. PPA Diagnosis criteria for inclusion and exclusion**

Inclusion: criteria 1–3 must be answered positively	Exclusion: criteria 1–4 must be answered negatively for a PPA diagnosis
1. Most prominent clinical feature is difficulty with language	1. Pattern of deficits is better accounted for by other nondegenerative nervous system or medical disorders
2. These deficits are the principal cause of impaired daily living activities	2. Cognitive disturbance is better accounted for by a psychiatric diagnosis
3. Aphasia should be the most prominent deficit at symptom onset and for the initial phases of the disease	3. Prominent initial episodic memory, visual memory, and visuo-perceptual impairments
	4. Prominent, initial behavioral disturbance

PPA: Primary Progressive Aphasia

In the study group, ages ranged from 51 to 63 years (for PPA semantic  $57.00 \pm 3.25$ ; for PPA logopenic  $57.27 \pm 2.49$ ). Detailed demographic information of the participants were reported in supplement 1. For our study, the inclusion criteria for PPA were as follows: (1) having been diagnosed as PPA by a neurologist; (2) history of no other psychiatric or neurological disease other than PPA; (3) being native speaker of Turkish; (4) not having depression; (5) having adequate sensory acuity to complete the tasks; and (6) giving consent to attend to the study. The exclusion criteria for our study were as follows: (1) having a history of other psychiatric or neurological disease, (2) not having adequate sensory acuity to complete the tasks, (3) not completing all the assessments, (3) having depression.

In order to evaluate the participants' semantic knowledge, cognitive ability, and proverb comprehension, The Pyramids and Palm Trees Test (PPTT), the Montreal Cognitive Assessment Scale (MoCA), and the Proverb Test were utilized respectively. For data collection, two speech and language therapists trained in the assessment tools applied all the tools in the same session, taking a 15-minute break after each task. In the following paragraphs, detailed explanations for each test will be given.

**The Pyramids and Palm Trees Test (PPTT):** The Pyramids and Palm Trees Test, also known as the PPTT, is a memory test that is frequently utilized for the purpose of evaluating semantic memory.<sup>[16]</sup> The examination consists of 52 different word or picture combinations. Each group consists of either three words or three illustrations. The subject is shown with three items and asked, "Which one of the lower two items goes with the upper item?" The stimulus, which could be, for example, a pyramid, is placed on top. The participant is responsible for correctly matching it with the target item (for example, the palm tree), while disregarding the distractor item (for example, the pine tree) in accordance with the available semantic knowledge. Normative data for PPTT Turkish was collected by Bozdemir and Gurvit.<sup>[17]</sup>

**The Montreal Cognitive Assessment Scale (MoCA):** It was developed by Nasreddine et al. in order to make a rapid assessment of cognitive impairment and to distinguish especially healthy individuals from Mild Cognitive Impairment.<sup>[18]</sup> It is used to evaluate various cognitive functions such as concentration, executive functions, memory, language, visual construction skills, abstract thinking, calculation, and orientation. The lowest score that can be obtained from the scale is 0, and the highest score is 30. Adaptation of MoCA to Turkish was made by Selekler et al.<sup>[19]</sup>

**The Proverb Scale:** This scale was developed for Turkish by Aydin et al. and it has 20 items. Items were balanced according to their abstraction and frequency.<sup>[20]</sup> On the Proverbs Scale, items were given values of 0, 1, and 2 according to their accuracy and relatedness. In the Proverb test, they were asked to give an oral explanation to the proverbs that they are given and they were scored according to their explanations. Answers that were wholly unrelated to the question were awarded a score of 0.

## Procedures

All participants were asked to complete MoCA, PPTT, and the Proverb test in the same order. All participants were first answered questions regarding their demographic information and then continued with the tasks in the same session, which lasted 30 minutes to 2 hours. Before the assessment, participants and their relatives were informed in detail about the tests, scales, and duration of the assessment. Participants were informed that they had the right to terminate the assessment at any time. Data collection was carried out in a clinical environment without external noise or distracting sound or image exposure.

## Statistical Analysis

The study's data were analyzed using the SPSS 25 (Statistical Package for the Social Sciences). The results were evaluated using a 95% confidence interval and a significance level of  $p < 0.05$ . Frequency (n) and percentage (%) are used in descriptive statistics. For normality, a Kolmogorov-Smirnov test indicated that MoCA scores of the participants followed a normal distribution ( $p=0.200$ ); however PPTT ( $p=0.035$ ) and idiom comprehension tasks ( $p=0.004$ ) did not. Therefore, independent t test was used to compare MoCA scores and Mann Whitney-U test was used to compare PPTT and idiom comprehension. Correlation coefficient was also calculated for svPPA and lvPPA groups.

## RESULTS

In the study, we examined the proverb comprehension of a total of 22 individuals including 11 svPPA and 11 lvPPA. It was determined that the mean age of 11 (50%) participants with svPPA was  $57.00 \pm 3.25$  and 11 (50%) participants with lvPPA was  $57.27 \pm 2.49$ . While 9.1% (2 participants) of the participants had a middle school education, 45.5% (10 participants) had a high school education and 45.5% (10 participants) had a university education. Detailed information for demographics were shown in the **Supplement 1**.

In **Table 2**, the statistical analyses performed to assess the differences between svPPA and lvPPA groups regarding the Proverb Scale and PPTT scores of are shown. As shown in the **Table 2**, there was a significant difference between svPPA and lvPPA group regarding proverb comprehension and PPTT ( $p=0.012$ ). When this was analyzed, it was revealed that those with svPPA had lower scores in proverb comprehension and higher scores in PPTT.

**Table 2. Mann Whitney-U test results for PPTT and the Proverb Scale**

Variables		svPPA (N=11)	lvPPA (N=11)	Z score	P score
PPTT	Mean Rank	14.95	8.05	-2.507	0.012*
	Summary of Ranks	164.50	88.50		
Proverb comprehension	Mean Rank	6.00	17.00	-4.011	0.000*
	Summary of Ranks	17.00	187.00		

\* $< .05$  \*\* $< .01$  \*\*\* $< .001$  SD: standard deviation, PPTT: The Pyramids and Palm Trees Test, svPPA: Semantic Variant Primary Progressive Aphasia, lvPPA: Logopenic Variant Primary Progressive Aphasia

## Supp 1. Detailed information for demographics

ID	Gender	Year of Birth	Educational status	Job	Marital status	Aphasia Type	Damage Area	Diagnosis of aphasia	Dominant hand	ADD (Total 292)
L1	W	1970	High School	Officer	Single	Logopenic (PPA)	left posterior perisylvian atrophy	7 months ago	Right	198
L2	M	1967	University	Engineer	Married	Logopenic (PPA)	left posterior perisylvian atrophy	5 months ago	Right	177
L3	W	1966	High School	Housewife	Married	Logopenic (PPA)	left posterior perisylvian atrophy	6 months ago	Right	176
L4	M	1969	University	Banker	Married	Logopenic (PPA)	left posterior perisylvian atrophy	7 months ago	Right	161
L5	M	1971	High School	Textile	Married	Logopenic (PPA)	left parietal atrophy	6 months ago	Right	198
L6	W	1973	Vocational School	Worker	Married	Logopenic (PPA)	left parietal atrophy	6 months ago	Right	200
L7	W	1974	High School	Housewife	Married	Logopenic (PPA)	left posterior perisylvian atrophy	4 months ago	Right	192
L8	M	1966	University	Engineer	Married	Logopenic (PPA)	left posterior perisylvian atrophy	5 months ago	Right	157
L9	W	1966	High School	Housewife	Married	Logopenic (PPA)	left posterior perisylvian atrophy	6 months ago	Right	168
L10	M	1969	University	Banker	Married	Logopenic (PPA)	left posterior perisylvian atrophy	7 months ago	Right	183
L11	M	1971	High School	Textile	Married	Logopenic (PPA)	left parietal atrophy	6 months ago	Right	194
S1	M	1971	High School	Officer	Married	Semantic (PPA)	anterior temporal lobe atrophy	5 months ago	Right	206
S2	M	1968	High School	Officer	Married	Semantic (PPA)	anterior temporal lobe atrophy	7 months ago	Right	204
S3	W	1967	High School	Officer	Married	Semantic (PPA)	anterior temporal lobe atrophy	5 months ago	Right	198
S4	W	1970	University	Academician	Single	Semantic (PPA)	anterior temporal lobe atrophy	6 months ago	Right	179
S5	W	1974	High School	Housewife	Married	Semantic (PPA)	anterior temporal lobe atrophy	4 months ago	Right	150
S6	W	1974	High School	Artisan	Married	Semantic (PPA)	anterior temporal lobe atrophy	3 months ago	Right	175
S7	M	1971	University	Business manager	Married	Semantic (PPA)	anterior temporal lobe atrophy	7 months ago	Right	208
S8	M	1970	High School	Officer	Married	Semantic (PPA)	anterior temporal lobe atrophy	5 months ago	Right	216
S9	M	1968	High School	Teacher	Married	Semantic (PPA)	anterior temporal lobe atrophy	7 months ago	Right	176
S10	W	1966	High School	Organizasyon Şirketi	Married	Semantic (PPA)	anterior temporal lobe atrophy	5 months ago	Right	170
S11	W	1978	University	Banker	Single	Semantic (PPA)	anterior temporal lobe atrophy	6 months ago	Right	164

In **Table 3**, the statistical analyses performed to assess the differences between svPPA and lvPPA groups regarding MoCA scores are shown. As shown in the **Table 3**, there was a significant difference between svPPA and lvPPA group regarding MoCA scores ( $p < 0.001$ ). When this was analyzed, it was revealed that those with svPPA had higher scores in MoCA.

**Table 3. Independent samples t-tests for MoCA**

Variables	svPPA (N=11)		lvPPA (N=11)		t	p
	M	SD	M	SD		
MoCA	9.36	2.203	4.45	2.252	5.168	0.00*

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$ , M: Mean, SD: standard deviation, MoCA: The Montreal Cognitive Assessment Scale, svPPA: Semantic Variant Primary Progressive Aphasia, lvPPA: Logopenic Variant Primary Progressive Aphasia

We then performed correlation analysis for each PPA groups regarding MoCA, The Proverb Scale and PPTT. As shown in **Table 4**, there was a high correlation between the Proverb Scale and MoCA scores in svPP ( $p = 0.711$ ). In the other variables, there was no correlation between proverb comprehension and PPTT. We also performed correlation analysis for lvPPA group regarding MoCA, The Proverb Scale and PPTT. **Table 5** shows correlation analysis for lvPPA. As shown in **Table 5**, there was no correlation between idiom comprehension, MoCA and PPTT.

**Table 4. Correlation for svPPA**

		MoCA	Proverb	PPTT
MoCA	r	1	0.711*	0.427
	p		0.14	0.190
	N	11	11	11
The Proverb Scale	r	0.711*	1	0.282
	p	0.014		0.401
	N	11	11	11
PPTT	r	0.427	0.282	1
	p	0.190	0.401	
	N	11	11	11

\* $p < .05$  significant relationship; \*\*  $r = 0-.30$  weak,  $.30-.50$  low,  $.50-.70$  medium,  $.70$  and above high correlation (+/-). MoCA: The Montreal Cognitive Assessment Scale, PPTT: The Pyramids and Palm Trees Test, svPPA: Semantic Variant Primary Progressive Aphasia

**Table 5. Correlation analysis for lvPPA**

		MoCA	Proverb	PPTT
MoCA	r	1	-0.112	-0.175
	p		,744	0.607
	N	11	11	11
The Proverb Scale	r	-0.112	1	-,062
	p	0.744		,857
	N	11	11	11
PPTT	r	-0.175	-0.062	1
	p	0.607	0.857	
	N	11	11	11

\* $p < .05$  significant relationship; \*\*  $r = 0-.30$  weak,  $.30-.50$  low,  $.50-.70$  medium,  $.70$  and above high correlation (+/-). MoCA: The Montreal Cognitive Assessment Scale, PPTT: The Pyramids and Palm Trees Test, lvPPA: Logopenic Variant Primary Progressive Aphasia

## DISCUSSION

The primary objective of this study was to determine whether the understanding of proverbs in PPA is impaired by comparing semantic and logopenic variants. nodules. It is an important study, as there is no other study of Turkish speaking PPA patients proverb comprehension as for our knowledge. As for the aim of our study, we found out that all participants had low scores in the PPTT task, which is a semantic network assessment task. In this task, the highest score a person can get is 52, in both PPA groups, it was comparatively low. Especially in lvPPA, access to the semantic network is impaired, when compared to svPPA patients. In the literature it was suggested that svPPA is distinguished from logopenic variant primary progressive aphasia (lvPPA) and nonfluent agrammatic variant primary progressive aphasia (nfvPPA) based on performance on semantic memory tasks.<sup>[15]</sup> One of the interesting findings of our study that lvPPA group had lower score when it was compared to svPPA. As in the literature it was suggested that only svPPA patients had impaired object semantics, however in our study group lvPPA had also lower scores.

Apart from PPTT scores, MoCA scores were found to be significantly different between svPPA and lvPPA. In the previous studies, it was evident that PPA patients can be differentiated by using language and attention subtest of MoCA, when it was compared with AD.<sup>[21]</sup> It can be explained by the nature of PPA, as it starts with the decline in language abilities and continues to deteriorate. Even though it was evident in the cognitive assessment that different PPA subtypes can be significantly different in cognitive abilities, it is still very important to conduct comprehensive and rigorous neuropsychological assessment to clinically diagnosis of dementia phenotypes.

When it comes to the proverb comprehension, patients with svPPA had significantly lower scores than lvPPA. This can be explained Marshall et al., the problem in svPPA is not merely a problem of accessing words in memory, but erosion of vocabulary itself. Therefore, the most significant change is in the ability to retrieve words from storage. It is more accurately described as a lack of comprehension or recognition of words and objects than anomia.<sup>[4]</sup>

The higher the MoCA score, the higher the proverb comprehension in the participant with svPPA. It is an important finding to show that there is a strong correlation between executive functions and cognition when it comes to language and comprehension. Idioms are multiword constructs whose metaphorical meanings cannot be computed from the literal meanings of their component words, yet are understood swiftly and easily by unimpaired Individuals diagnosed with lvPPA frequently struggle with comprehension of sentences.<sup>[22-25]</sup>

Also, we found a high correlation between the MoCA and proverb comprehension in svPPA.

Individuals diagnosed with lvPPA frequently struggle with comprehension of sentences.<sup>[15-27]</sup> Our results in idiom comprehension were in line with this finding of previous research. The highest score achieved was 23 out of 40, so their explanations for idioms were almost half correct and it shows that they have difficulty in abstraction. It is also quite important to note that familiarity is an indicator for proverb comprehension. The data from these several measures of understanding all demonstrate the fact that familiarity improves proverb comprehension.<sup>[27]</sup>

Inhibition is also very important in understanding PPA. As the neurodegeneration progress, so does the deterioration in executive functions. Papagno et al. suggested that patients with Alzheimer's disease are aware of the proverb's meaning, but that the literal interpretation, which is also activated, significantly interferes with it; it also indicates that patients do not choose the literal interpretation based on a single word in the idiom.<sup>[5]</sup> It appears that patients are unable to suppress literal interpretation when it is represented explicitly. It can be the case in the primary progressive aphasia. Therefore, more comprehensive research should be conducted to understand the difference in PPA.

### Clinical Implications

Since Primary Progressive Aphasia (PPA) is considered a language-related class of dementia, it is diagnosed by focusing on different cognitive and executive symptoms, and the loss of naming skills and differentiation in speech production may be overlooked. For this reason, in the clinical context, understanding the precursor symptoms at the initial stage will contribute to maintaining the communication and quality of life of the cases as much as possible, even in a neurodegenerative condition. The assessment procedures of comprehension and abstraction skills remain incomplete from the perspective of speech and language therapy due to the need to develop Turkish assessment procedures and the limited availability of language assessment batteries for PPA. For these reasons, studies for the PPA group, which has minimal access, are critical for the processes to be understandable in these case groups. It is essential for the evaluation processes to provide information findings in terms of the abstraction ability of proverbs and to provide inferences about naming performances.

### Limitations

One of the limitations of the study is the number of the participants, as PPA is hard to reach population. More comprehensive studies with larger groups including nvPPA may help understanding PPA more. Also, other means of proverb comprehension tools can be used in order to explain the findings such as matching pictures etc.

As a case group, access to PPA is very difficult and limited. In this respect, the multidimensional and costly evaluation procedures and the evaluation of PPA as a general dementia

group, and the studies carried out on dementia variants are of great importance. Access to case groups and all types remains quite limited, and the study is limited in terms of the number of participants. The fact that the participants' emotional states are negative in terms of decreased attention process and neurodegenerative features causes the test and evaluation tools applied to be limited. In this respect, our study was carried out as a single center with 2 variants and limited evaluation tools.

### CONCLUSION

The proverb comprehension task can help shed light on PPA by providing evidence of sound, word, and sentence production. For the further studies, item analysis for literal and non-literal meanings for idioms can be explored. According to our research, one of the primary factors that contributes to impairment in proverb comprehension may be difficulties accessing figurative meanings. In order to understand this phenomenon better, further studies should be conducted.

### ETHICAL DECLARATIONS

**Ethics Committee Approval:** The study was carried out with the permission of Bahçeşehir University Research and Publication Ethics Committee (Date: 27/04/2023, Decision No:E-85646034-604.02.02-59908)

**Informed Consent:** All patients and their families signed the free and informed consent form.

**Referee Evaluation Process:** Externally peer-reviewed.

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