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Effectiveness of Epley's Maneuver on Dizziness, Dynamic Balance and Quality of Life in Individuals with Benign Paroxysmal Positional Vertigo (BPPV): Case Series

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Abstract

Background: Benign paroxysmal positional vertigo (BPPV) is the most prevalent peripheral vestibular disorder, characterized by transient episodes of vertigo triggered by changes in head position relative to gravity (1). Though often underdiagnosed, BPPV significantly impacts quality of life and functional independence. Epley's maneuver, a canalith repositioning procedure, is widely accepted as a first-line treatment, especially for posterior canal BPPV (6). However, limited case series have been documented on validated clinical scales like the Dizziness Handicap Inventory (DHI), Dynamic Gait Index (DGI), and Vestibular Activities of Daily Living (VADL) in individuals with BPPV.

Objective: To evaluate the effectiveness of Epley's maneuver in improving dizziness, dynamic balance, and quality of life in patients diagnosed with BPPV using Dizziness Handicap Inventory (DHI), Dynamic Gait Index (DGI), and Vestibular Activities of Daily Living (VADL).

Methodology: This case series comprised four patients diagnosed with BPPV through clinical examination and positional tests, including the Dix-Hall pike, supine roll tests and characteristic nystagmus patterns. Informed consents were obtained from all the patients. Epley's maneuver was administered twice weekly, with each position held for 30 seconds over a 15-minute session. All patients were educated on and prescribed Brandt-Daroff exercises as a home program (5 cycles per set, 3 sets per day). DHI, DGI, and VADL scores were assessed at baseline and post treatment.

Results: All four patients showed a substantial reduction in dizziness and functional impairment, along with an improvement in dynamic balance. Case 1: A 32-year-old female with left posterior canal BPPV showed a DHI reduction from 82 to 32, DGI improvement from 15 to 22, and VADL from 114 to 36 by week 8. Case 2: A 45-year-old male with left posterior canal BPPV had marked early improvement with DHI dropping from 45 to 10, DGI increasing from 8 to 23, and VADL improving from 45 to 36 in just one week. Case 3: A 54-year-old female with multi-canal BPPV demonstrated steady improvements from baseline (DHI 96, DGI 8, VADL 143) to week 3 (DHI 68, DGI 20, VADL 73). Case 4: A 31-year-old female with right posterior canal BPPV showed significant improvement by week 8, with DHI improving from an estimated moderate score to 25, DGI from 13 to 23, and VADL from 54 to 36. No adverse effects were reported, and positional tests showed reduction in nystagmus.

Conclusion: Epley's maneuver is highly effective in managing posterior and multi-canal BPPV, resulting in rapid and measurable improvements in dizziness, balance, and daily functioning. When combined with patient education and home-based Brandt-Daroff exercises, this protocol offers a safe, cost-effective, and accessible treatment strategy. Systematic use of clinical scales like DHI, DGI, and VADL enhances outcome monitoring and supports patient-centered care in vestibular rehabilitation.
Clinical implication: For selection of appropriate treatment technique, it is essential to observe and identify the onset, direction, duration, latency; fatigability of nystagmus also plays an important role. Application of unsupervised Brandt-Daroff exercises as a home exercise program is found to be beneficial in all the 4 patients that showed the symptoms of BPPV and thus prevent the recurrence.

Keywords: Benign Paroxysmal Positional Vertigo (BPPV), Epley's Maneuver, Dizziness Handicap Inventory (DHI), Dynamic Gait Index (DGI), Vestibular Activities of Daily Living (VADL), case series, vestibular rehabilitation**.**

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is a mechanical disorder of the inner ear's membranous labyrinth, characterized by brief, recurring episodes of vertigo triggered by specific head movements with respect to gravity (1). The frequency of peripheral vertigo is higher than that of central vertigo (1).
The incidence of benign paroxysmal positional vertigo (BPPV) among patients ultimately diagnosed with vertiginous symptoms varies from 17% to 42% from 2020 to 2023 (2). Benign paroxysmal positional vertigo (BPPV), which has a lifetime prevalence of 2.5% to 10%, is identified in 20% of vertigo patients (3).In a research investigation conducted in Europe, the prevalence of benign paroxysmal positional vertigo (BPPV) varied between 10.7 to 64 cases per 100,000 individuals each year. This data positions the lifetime occurrence rate of the ailment at 2.4% (4).
Vertigo is believed to be produced by the displacement of otoliths from otolithic organs into the semi-circular canals, and although each episode is brief, it usually recurs in weeks if treatment is not received. The reason behind the otolith displacement is yet unknown, though. BPPV is caused by vestibular lithiasis, which exists in two forms, Canalolithiasis occurs when degenerative otoconial debris detaches from the utricular matrix and enters one of the three semi-circular canals, posterior, horizontal, or anterior, in that order of frequency. While cupulolithiasis involves the otoconial debris becoming inappropriately adhered to the cupula, making it heavy and gravity-sensitive, and existing in two forms, one where the debris attaches to the canal side (Cup-C) or the utricular side (Cup-U) of the cupula.
Benign Paroxysmal Positional Vertigo (BPPV) typically manifests as recurrent, brief episodes of vertigo, often triggered by head position changes such as looking up, bending over, lying down, or rolling over in bed. The characteristic symptom is frequent episodes of vertigo lasting less than a minute, usually triggered by head movements. However, some patients, particularly the elderly, may experience prolonged unsteadiness instead of the typical brief vertigo. The illusion of movement during BPPV attacks is commonly rotatory, but a sensation of body tilt can also occur. During these attacks, patients may also complain of imbalance, oscillopsia, nausea, and, in some cases, vomiting. They are typically aware that certain head movements precipitate these attacks of vertigo and often develop strategies to avoid triggering them, such as propping themselves up or holding their neck stiff. However, these compensatory behaviours may lead to immobility and prolong the course of the disease. Following a series of attacks, some patients may report prolonged dizziness and imbalance lasting from hours to days

(5). In most cases the cause of BPPV idiopathic which accounts for about 50%–70% of cases. The most common cause of secondary BPPV is head trauma, representing 7%–17% of all BPPV cases which can involve both the ears. Vestibular neuronitis, Meniere's disease, migraine and inner ear surgery have also been shown to be strongly associated with BPPV.

Dizziness is one of the most prevalent complaints in medicine, affecting 15–35% of the general population, and BPPV accounts for approximately one-third of all cases. Despite being the most common cause of peripheral vertigo, BPPV is still often under diagnosed or misdiagnosed [6]. It is important to understand BPPV not only because it may avert expensive and often unnecessary investigations, but also because treatment is rapid, easy and effective in more than 90% of cases [7]. The diagnosis of BPPV is typically established through a thorough clinical history, positional testing, and the observation of characteristic nystagmus. The gold standard method for provocation and confirmation of PC-BPPPV is Dix hallpike maneuver (8).

Although numerous studies have explored individual aspects of BPPV diagnosis and management, comprehensive case series provide insights into the clinical spectrum of BPPV, the diagnostic utility of positional tests such as the Dix-Hallpike maneuver, and the practical effectiveness of repositioning maneuvers like the Epley's maneuver. Additionally, patient-reported outcomes such as dizziness handicap inventory (DHI), dynamic gait index (DGI), and vestibular activities of daily living (VADL) are often underrepresented in literature but play a critical role in clinical decision-making and rehabilitation planning.

This case series aims to document and analyse varied presentations of BPPV, assess outcomes using validated clinical scales, and evaluate the effectiveness of Epley's maneuver.

CASES DESCRIPTION:

CASE 1

A 32-year-old female patient presented with complaints of dizziness for the past month. The dizziness was primarily triggered when getting out of bed or transitioning from sitting to standing, and was notably worsened by head movements to the left side. She reported episodes of severe dizziness lasting 3–4 minutes, accompanied by provoked nystagmus lasting less than one minute. There was no history of trauma, hearing loss, tinnitus, or vomiting.

On examination, a 256 Hz Rinne test was positive bilaterally, and the Weber test showed no lateralization. The Dix-Hallpike maneuver was performed bilaterally, during which the patient experienced dizziness accompanied by left-sided geotropic horizontal nystagmus. Based on these findings, a diagnosis of left posterior canal BPPV was made.

Initial assessment revealed a VADL score of 114, indicating significant fear of falling. DHI score was 82, suggesting a severe perceived handicap, and DGI score was 15, reflecting impaired dynamic balance on Day 0 i.e., on the day of assessment.

CASE 2

A 45-year-old male with no relevant medical history presented with a 3-month history of head-spinning sensations accompanied by nausea. The initial episode occurred when rising from a lying position and lasted approximately 30 seconds, followed by walking instability on the first day. Subsequently, he experienced increasingly frequent episodes of dizziness lasting over one minute, particularly when rising from supine or rolling in bed. He described these episodes as overwhelming, with a sensation that the entire room was spinning. In one instance, after waiting a few minutes to settle himself, he deliberately

repeated the head movement—turning to the left and leaning back—and again experienced the same intense rotary vertigo.

On examination, a 256 Hz Rinne test was positive bilaterally, and the Weber test revealed no lateralization. The Dix-Hallpike maneuver was performed on both sides. On the right, the patient exhibited dizziness accompanied by upbeat and left torsional nystagmus lasting for approximately 20 seconds, which transitioned into downbeat nystagmus. No symptoms were elicited on the left side. Based on these findings, a diagnosis of left posterior canal BPPV (canalithiasis) was established. On initial assessment of dizziness (DHI) , DGI and VADL scored 45,8,45 respectively.

CASE 3

A 54 year old female with a history of hypertension, presented with a complaint of 2 week onset of vertigo symptoms. She had a complaint of dizziness when sitting up from lying and rolling on bed. She also reported gait instability where she had to hold onto wall or furniture to walk and cannot turn head while walking.

On examination, a 256 Hz Rinne test was positive bilaterally, there was no lateralization in the weber test. On right dix hallpike maneuver, the patient showed no symptoms of dizziness with persistent left downbeat and right downbeat for > 30 sec and on left Dix Hallpike maneuver, presented with moderate to severe dizziness and nausea lasting for >3 min in each position, with upbeat torsional nystagmus. On right supine roll test, the patient exhibited no symptoms of vertigo with left apogeotropic nystagmus lasted for 10 seconds on left supine roll test, presented no vertigo symptoms with right apogeotropic beat nystagmus lasted for 23 sec transition. Diagnosed with right Multi canal (posterior and anterior canal) BPPV.

Baseline evaluation revealed severe dizziness by DHI of 96, severe dynamic balance impairment evident with DGI score of 8 and VADL score of 143.

CASE 4

A 31 year old female presented with a sense of spinning while moving from a standing to sitting position and had a symptom of nausea. There were two episodes lasting a few minutes, and it worsened in the right lateral position. No history of diplopia, weakness, headache, dysarthria, hearing loss, tinnitus, allergies and no history of similar illnesses in the past or in the family.

On clinical examination, a 256 Hz Rinne test was performed and found to be positive bilaterally, suggesting normal or sensorineural hearing. The Weber test demonstrated no lateralization, further supporting the absence of significant unilateral conductive or sensorineural hearing loss. The Romberg test was positive, with the patient exhibiting postural instability particularly with a tendency to sway towards the left side, indicating a possible left-sided vestibular dysfunction.

The Dix-Hallpike maneuver was subsequently performed to evaluate for BPPV, a counter-clockwise torsional nystagmus with an up-beating component was observed, which lasted for several seconds. Considering characteristic findings on positional testing, a diagnosis of right posterior semicircular canal BPPV was confirmed.

CHARACTERISTICS	CASE 1	CASE 2	CASE 3	CASE 4
Age	32	45	62	31
Gender	Female	male	Female	Female
comorbidities	HTN	No comorbidities	HTN	No comorbidities

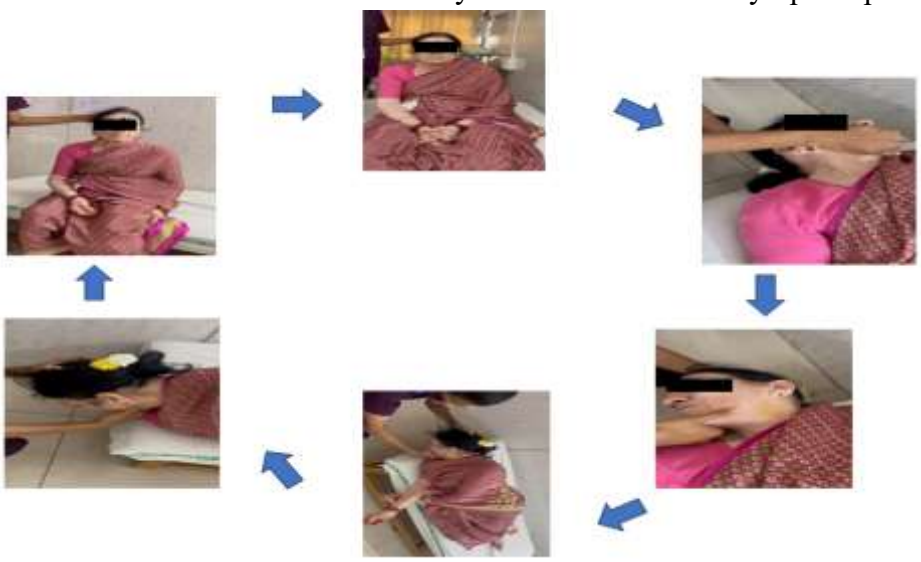
semicircular canal involved	Left posterior semicircular	Left posterior semicircular	Multi canal (posterior and anterior canal)	Left posterior semicircular canal
Frequency of BPPV	1st time	1st time	1st time	2nd time
Nystagmus (absent/present)	Present	Present	Present	Present
Type of nystagmus	Geotropic horizontal nystagmus	left torsional upbeat nystagmus	Right DHM: persistent left upbeat and right upbeat. Right supine roll test: apogeotropic Nystagmus.	left torsional upbeat nystagmus
Duration of nystagmus	3 minutes	>30 sec	23 -10 seconds	30 seconds
Nausea	absent	present	present	present

INTERVENTION:

Intervention Protocol

All four patients diagnosed with BPPV underwent a standardized treatment regimen in accordance with AAO-HNSF guideline. Each patient is treated with Epley's maneuver, administered twice weekly, with each positional step maintained for approximately 30 seconds or until vertigo and nystagmus resolved. Each session lasted around 15 minutes.

Repeated CRP was employed in cases where immediate resolution was not achieved, following guideline recommendation that serial maneuvers may be needed based on symptom persistence.

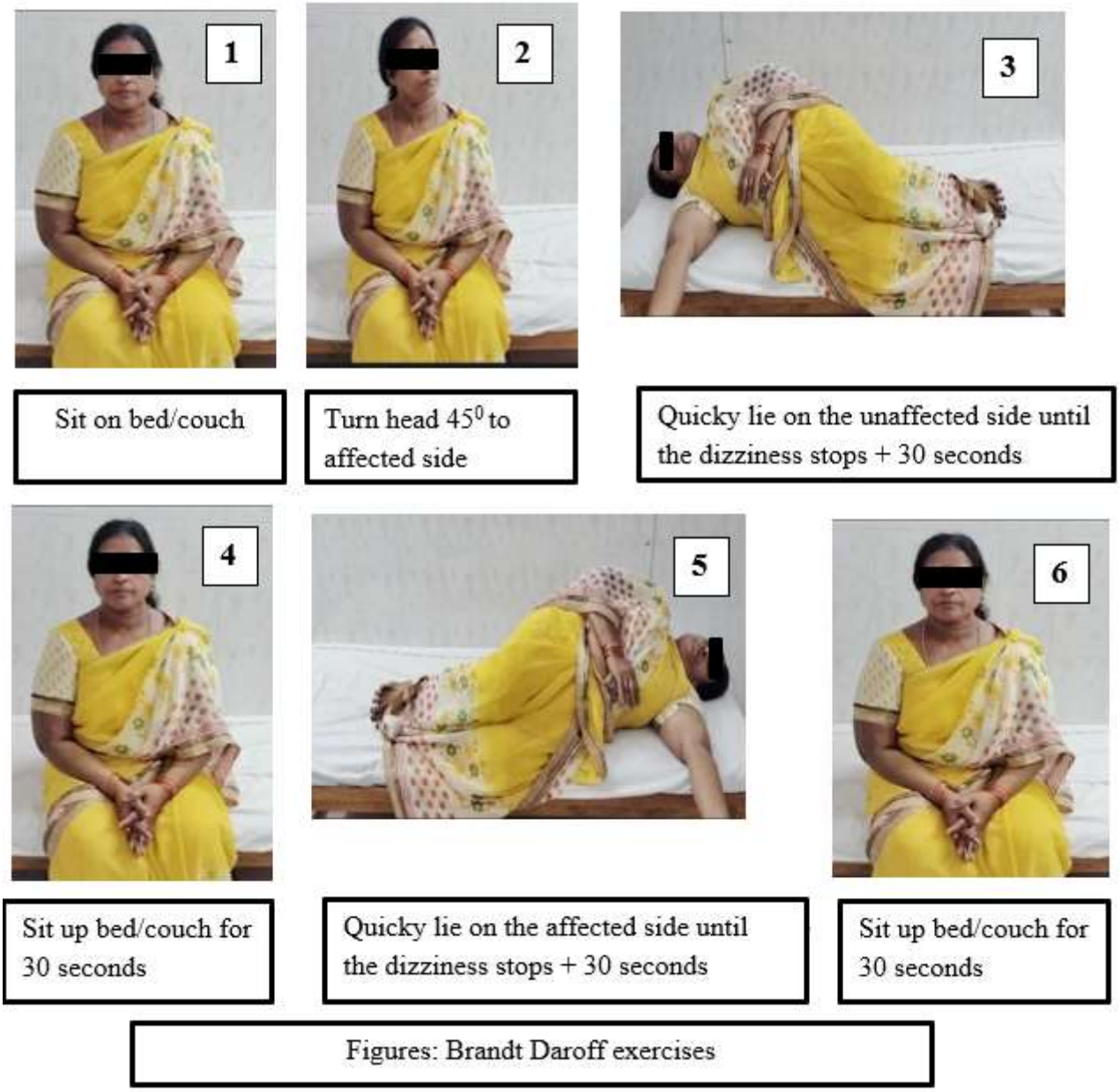


Figures: Brandt Daroff exercises

Home-Based Vestibular Rehabilitation:

Patients were instructed and trained Brandt-Daroff exercises, performing five repetitions per set, three sets daily for two weeks.

Each repetition involved moving from sitting to lying on each side with the head turned 45°, held for 30 seconds or until vertigo subsided. These habituation exercises target residual dizziness.



Figures: Brandt Daroff exercises

OUTCOME MEAURES:

Treatment effectiveness was evaluated using validated scales the Dizziness Handicap Inventory (DHI), Dynamic Gait Index (DGI), and Vestibular Activities of Daily Living (VADL) at baseline and at weekly follow-ups.

Patient Education and Safety:

Emphasis was placed on patient education regarding the nature, prognosis, and recurrence potential of BPPV, and on adherence to home exercises

Patients were advised to perform home exercises in a safe environment, with assistance available if needed, to mitigate fall risk during symptomatic episodes.
No prophylactic vestibular suppressant medications were prescribed.

RESULTS:

Case	Time point of assessment	DHI Score	DGI Score	VADL Score
Case 1	Baseline	82	15	114
	4 Weeks Post-treatment	64	20	76
	8 Weeks Post-treatment	32	22	36
Case 2	Baseline	45	8	45
	1 Week Post-treatment	10	23	36
Case 3	Baseline	96	8	143
	2 Weeks Post-treatment	83	14	126
	3 Weeks Post-treatment	68	20	73
Case 4	Baseline	15	18	89
	4 Weeks Post-treatment	32	13	54
	8 Weeks Post-treatment	25	23	36

DISCUSSION

BPPV is primarily a disorder of canalithiasis, where in otoconia detach from the utricular otolith membrane and migrate into one or more semicircular canals. (13) This abnormal mobility of otoconia triggers vestibular input mismatch, causing transient intense vertigo and characteristic positional nystagmus latent, fatigable, lasting 10–60 seconds. (14) In this case series, Case 1 showed geotropic horizontal nystagmus; Case 2 had upbeat with torsional nystagmus, Case 3 involved multi-canal BPPV (posterior/anterior) with complex nystagmus, Case 4 exhibited torsional upbeat nystagmus all consistent with canalithiasis.

Beyond the peripheral mechanics, the CNS employs compensation to recalibrate vestibular inputs and restore balance. This includes vestibulo-ocular reflex (VOR) adaptation (15) Vestibulospinal recalibration, Sensory re-weighting. (16) Although compensation occurs naturally, rehabilitation accelerates adaptation and corrects maladaptive movement patterns caused by fear or reduced mobility.

Epley's maneuver guide the displaced otoconia back into the utricle using gravity and specific head/body positioning, the crystals transit through the affected canal, exiting via the common crus to the vestibule. (17) When crystals vacate the Canal, immediate peripheral normalization reduces aberrant vestibular input, halting stimulus-induced dizziness. Subsequent central recalibration in brainstem/cerebellar pathways smooth's residual asymmetry. (18)

A 2021 systematic review comparing Epley's vs vestibular rehabilitation found significantly higher 1-week resolution rates with Epley's (risk differences 10–55%) (19) Another systematic review (2000–2022) concluded Epley's yields significant long-term symptom relief, including reductions in nystagmus and dizziness-related quality-of-life impairments. (18) Meta-analysis supports inclusion of repositioning

maneuvers in all posterior canal BPPV cases, with substantial objective and subjective improvements by 1 week and up to 1 month. (20)

In all the four cases, Epley's maneuver yielded measurable improvements in which Case 2 achieved DHI decline from 45 to 10 and VADL from 45 to 36 within just 1 week. Case 1 and Case 3 required up to 3–8 weeks, reflecting multi-canal complexity or more severe baseline symptoms but still demonstrated consistent progress.

As dizziness diminishes and mobility is regained, patients report improved self-efficacy, critical for long-term engagement in rehab and social re-engagement in accordance with results shown in Case 1 progressed from requiring assistance (VADL 114) to independent functioning (VADL 36). This reversal is emblematic of regaining psycho-social freedom, not just balance. Case 3, involving both posterior and anterior canals, predicted a longer rehab trajectory due to complex otoconial patterns and slower compounding repositioning which is predicted by Baseline assessment of DHI >90 and VADL >140 indicating prolonged limitations due to sensory deprivation, fear, and reduced activity. Recovery thus involves more time for central compensation and psychological trust.

The observed gains in DHI, DGI, and VADL scores correlate with a coherent mechanism consisting of peripheral liberation from otoconia, central vestibular realignment, and regained psychosocial autonomy. These findings validate present evidence-based care for BPPV and highlight the synergy between mechanical and neurophysiological rehabilitation strategies.

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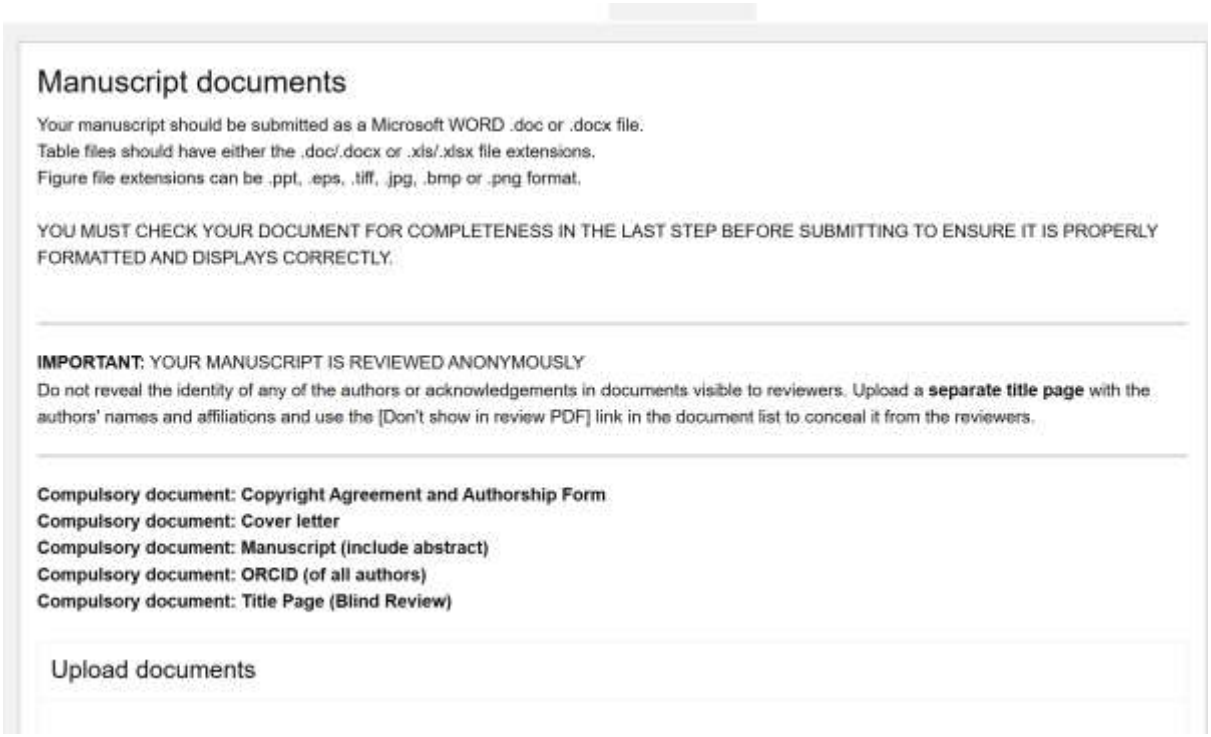

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