Original Article

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Comparative Analysis of Treatment Modalities for Bell's Palsy and Their Effectiveness

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ABSTRACT

Background: *Bell's Palsy is an acute peripheral facial neuropathy characterized by sudden, unilateral facial paralysis. Various treatment modalities, including corticosteroids, antivirals, combination therapies, physiotherapy, and acupuncture, have been explored to enhance recovery and improve outcomes. This study aims to comparatively analyze the effectiveness of different treatment modalities for Bell's Palsy, focusing on facial nerve recovery, quality of life, pain levels, adverse effects and treatment adherence.*

Materials and methods: *A prospective, randomized controlled trial involving 300 participants diagnosed with Bell's Palsy was conducted across multiple centers during the period from January to June 2024. Participants were randomly assigned to one of six treatment groups: corticosteroids, antivirals, combination therapy (Corticosteroids and antivirals) physiotherapy, acupuncture or control (Placebo or no treatment). Primary and secondary outcomes were assessed using the House-Brackmann facial nerve grading system, Facial Disability Index (FDI) and Visual Analog Scale (VAS) for pain at baseline, 1 month, 3 months and 6 months post-treatment. Adverse effects and treatment adherence were also recorded.*

Results: *Combination therapy showed the most significant improvement in facial nerve recovery, with mean House-Brackmann grades improving from 3.1 at baseline to 1.1 at 6 months. The Combination group also reported the highest mean FDI score (78.5) and the lowest VAS pain score (1.9). The Corticosteroids group showed substantial improvements but to a lesser extent than the Combination group. Adverse effects were most common in the Corticosteroids and Combination groups, with insomnia and gastrointestinal issues being the most frequently reported. Treatment adherence was high across all groups, with the highest adherence in the Control group (95%).*

Conclusion: *Combination therapy with corticosteroids and antivirals is the most effective treatment modality for Bell's Palsy, significantly improving facial nerve recovery, quality of life and pain outcomes. Despite some adverse effects, the overall benefits support the use of combination therapy as the standard approach in managing Bell's Palsy. Future research should focus on optimizing treatment protocols and exploring long-term outcomes to further substantiate these findings.*

Key words: Acupuncture; Antivirals; Bell's palsy; Corticosteroids; Combination therapy; Facial nerve recovery; Physiotherapy; Pain management; Quality of life.

Introduction

Bell's Palsy is an acute peripheral facial neuropathy that manifests as sudden, unilateral facial paralysis. This condition is often idiopathic, though viral infections, particularly by the herpes simplex virus, are frequently implicated. The incidence of Bell's Palsy is approximately 20-30 cases per 100,000 population annually, making it a relatively common neurological disorder.[1] The treatment of Bell's Palsy aims to enhance recovery speed and maximize facial nerve function. Various therapeutic modalities have been explored, including corticosteroids, antiviral agents, physical therapy and surgical interventions. Corticosteroids, particularly prednisone, are widely regarded as the most effective first-line treatment due to their anti-inflammatory properties, which help reduce nerve swelling and improve outcomes.[2] The early administration of corticosteroids within 72 hours of symptom onset has been shown to significantly increase the likelihood of complete recovery.[3] A systematic review by Madhok VB et al. showed the efficacy of corticosteroids in improving recovery rates for Bell's Palsy.[4] Antiviral therapy is often considered in conjunction with corticosteroids, especially in cases suspected to be of viral origin. Turgeon RD et al. demonstrated the presence of herpes simplex virus DNA in the endoneurial fluid of patients with Bell's Palsy, suggesting a viral etiology in

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IAHS Medical Journal
Volume 07 Issue 02 December 2024; 47-51

many cases.[5] The combination of corticosteroids and antiviral agents such as acyclovir or valacyclovir is based on the premise that reducing viral replication may enhance recovery. Quant et al. conducted a meta-analysis that supported the use of antivirals in conjunction with corticosteroids, indicating improved recovery rates compared to corticosteroids alone.[6]

Physical therapy and rehabilitation exercises are employed to maintain muscle tone and prevent contractures, potentially aiding in the recovery of facial nerve function. Techniques such as facial exercises, massage and electrical stimulation are commonly used in rehabilitation protocols. A study highlighted the benefits of early physiotherapy, demonstrating that patients receiving physiotherapy showed improved outcomes in facial muscle function and reduced long-term sequelae.[7] Physical therapy aims to improve muscle strength and coordination, potentially accelerating the recovery process and reducing the likelihood of permanent dysfunction. Surgical interventions, although controversial, are considered in severe cases of Bell's Palsy unresponsive to medical therapy. Lee SY et al. reported favorable outcomes with surgical decompression in selected patients, although the risks and benefits must be carefully weighed.[8] This approach is reserved for patients with significant nerve damage and for those who do not respond to conventional medical treatments. Clinical guidelines and systematic reviews have provided evidence-based recommendations for the management of Bell's Palsy. The American Academy of Neurology's guideline update emphasized the efficacy of corticosteroids and provided recommendations for the use of antivirals in conjunction with steroids.[9] The Cochrane review by Lockhart et al. further supported these findings, indicating that the combination therapy could offer marginal benefits over corticosteroids alone.[10] The comparative analysis of these treatment modalities aims to evaluate their effectiveness in improving outcomes for patients with Bell's Palsy.

Materials and methods

The study was designed as a comparative analysis of the effectiveness of various treatment modalities for Bell's Palsy. This was a prospective, randomized controlled trial involving multiple centers during the period from January to June 2024 to ensure a diverse and representative sample population. Participants diagnosed with Bell's Palsy were recruited and randomly assigned to one of the treatment groups, including corticosteroid therapy, antiviral therapy, a combination of corticosteroids and antivirals, physiotherapy, acupuncture and a control group receiving a placebo or no treatment. The primary outcome measure was the degree of facial nerve recovery, assessed using the House-Brackmann facial nerve grading system at baseline, 1 month, 3 months and 6 months post-treatment initiation. Secondary outcome measures included patient-reported outcomes on quality of life, pain and functional impairment, utilizing validated questionnaires such as the Facial Disability Index (FDI) and the Visual Analog Scale (VAS) for pain. Data on adverse effects and treatment adherence were also collected. Statistical analysis involved comparing the primary and secondary outcomes across the different treatment groups using ANOVA for continuous variables and chi-square tests for categorical variables, with adjustments for potential confounders. Informed consent was secured from all participants. The study aimed to provide comprehensive data on the relative effectiveness and safety of these treatment modalities, guiding clinical decision-making and improving patient outcomes in Bell's Palsy.

Results

Table I Baseline Characteristics of Study Participants (n=300)

Characteristic	Corticosteroids (n=50)	Antivirals (n=50)	Combination (n=50)	Physiotherapy (n=50)	Acupuncture (n=50)	Control (n=50)
Age (Mean ± SD)	45.2 ± 12.3	46.1 ± 11.8	44.7 ± 13.0	45.5 ± 12.5	46.0 ± 11.9	45.3 ± 12.6
Gender (% male)	27(54%)	28(56%)	26(52%)	25(50%)	29(58%)	28(55%)
Duration of Symptoms (days)	3.5 ± 1.2	3.4 ± 1.3	3.6 ± 1.1	3.5 ± 1.0	3.4 ± 1.2	3.5 ± 1.1
House-Brackmann Grade (I-VI)	3.2 ± 0.8	3.3 ± 0.7	3.1 ± 0.9	3.3 ± 0.8	3.2 ± 0.7	3.2 ± 0.8

This Table summarizes that baseline characteristics have no significant difference with other values (F-test). This table also shows that baseline characteristics of participants across six treatment groups: Corticosteroids, Antivirals, Combination (Corticosteroids and Antivirals), Physiotherapy, Acupuncture and Control. The mean age of participants was approximately 45 years, with Standard Deviations (SD) ranging from 11.8 to 13.0, indicating a moderately varied age distribution. Gender distribution shows a slightly higher percentage of males across all groups, ranging from 50% to 58%. The duration of symptoms before treatment initiation averages around 3.5 days across all groups, with SDs indicating minimal variability. The initial House-Brackmann facial nerve grade averages around 3.2, with slight variations among groups, indicating a moderate degree of facial nerve dysfunction at baseline.

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 47-51

Table II Primary Outcome - Facial Nerve Recovery (House-Brackmann Grade) Over Time (n=300)

Time Point	Corticosteroids (n=50)	Antivirals (n=50)	Combination (n=50)	Physiotherapy (n=50)	Acupuncture (n=50)	Control (n=50)
Baseline	3.2 ± 0.8	3.3 ± 0.7	3.1 ± 0.9	3.3 ± 0.8	3.2 ± 0.7	3.2 ± 0.8
1 Month	2.5 ± 0.6	2.7 ± 0.7	2.3 ± 0.8	2.8 ± 0.7	2.6 ± 0.6	3.0 ± 0.7
3 Months	1.8 ± 0.5	2.0 ± 0.6	1.6 ± 0.6	2.1 ± 0.5	1.9 ± 0.5	2.5 ± 0.6
6 Months	1.2 ± 0.4	1.5 ± 0.5	1.1 ± 0.4	1.6 ± 0.4	1.3 ± 0.4	2.0 ± 0.5

This Table tracks the recovery of facial nerve function, measured by the House-Brackmann grade, at baseline, 1 month, 3 months, and 6 months' post-treatment. All groups show improvement over time. At baseline, the mean grades are similar across groups, averaging around 3.2. At 1 month, the Combination group shows the most significant improvement (Mean grade 2.3) followed by the Corticosteroids group (2.5). By 3 months, the Combination group continues to show the best recovery (1.6) with the Corticosteroids group (1.8) and the Acupuncture group (1.9) also showing substantial improvements. At 6 months, the Combination group achieves near-normal function (1.1) followed by the Corticosteroids group (1.2). The Control group shows the least improvement, maintaining higher mean grades throughout the follow-up period. By combination therapy the change of outcome is significant by t-test (p.05) after 6 months.

Table III Secondary Outcomes - Quality of Life and Pain (n=300)

Outcome Measure	Corticosteroids (n=50)	Antivirals (n=50)	Combination (n=50)	Physiotherapy (n=50)	Acupuncture (n=50)	Control (n=50)
FDI (mean ± SD)	75.2 ± 10.3	73.1 ± 11.2	78.5 ± 9.8	72.0 ± 10.5	74.3 ± 10.7	70.1 ± 11.4
VAS for Pain (mean ± SD)	2.1 ± 1.1	2.4 ± 1.3	1.9 ± 1.0	2.6 ± 1.2	2.2 ± 1.1	3.0 ± 1.4

This Table presents the secondary outcomes, focusing on quality of life measured by the Facial Disability Index (FDI) and pain levels measured by the Visual Analog Scale (VAS). The Combination group reports the highest mean FDI score (78.5), indicating better perceived quality of life, followed by the Corticosteroids group (75.2). The Control group reports the lowest FDI score (70.1). Pain levels, as indicated by VAS scores, are lowest in the Combination group (Mean 1.9) and highest in the Control group (Mean 3.0), suggesting that the Combination treatment is most effective in reducing pain associated with Bell's palsy. Change of FDI by combination therapy is very highly significant by t-test ($p<0.001$) and VAS for pain ($p<0.001$) by t-test.

Table IV Adverse Effects and Treatment Adherence (n=300)

Adverse Effect	Corticosteroids (n=50)	Antivirals (n=50)	Combination (n=50)	Physiotherapy (n=50)	Acupuncture (n=50)	Control (n=50)
Insomnia	5 (10%)	2 (4%)	4 (8%)	1 (2%)	0 (0%)	1 (2%)
Gastrointestinal Issues	3 (6%)	4 (8%)	5 (10%)	0 (0%)	1 (2%)	1 (2%)
Headache	2 (4%)	3 (6%)	3 (6%)	0 (0%)	2 (4%)	1 (2%)
Treatment Adherence (%)	92%	90%	94%	89%	91%	95%

This Table details the frequency of adverse effects and treatment adherence across the groups. Insomnia is most common in the Corticosteroids group (10%) and least common in the Acupuncture group (0%). Gastrointestinal issues are reported most frequently in the Combination group (10%) while the Physiotherapy group reports no such issues. Headaches are similarly infrequent across all groups, with the highest incidence in the Antivirals and Combination groups (6%). Treatment adherence is generally high across all groups, with the highest adherence seen in the Control group (95%) and the lowest in the Physiotherapy group (89%). This data suggests that while the Combination group shows the most significant improvement in facial nerve recovery and secondary outcomes, it also has a higher incidence of gastrointestinal issues, which could impact adherence.

In case of insomnia, the change by combination therapy and control group had no significant change (χ^2=2.1) of p.05 level, similarly GI symptoms also had no significant change with control P.05 level by combination therapy (χ^2=3.09). Same results also in case of headache caused by combination therapy and control group sample p.05 level (χ^2=1.303 Fisher's exact test). Facial nerve recovery had marked improvement (Significant) after 6 months observation. Outcome measured by FDI and VAS also depicted notable changes by combination therapy in comparison to control regime [t-test at p.05 level].

Discussion

This study aimed to comparatively analyze the effectiveness of various treatment modalities for Bell's Palsy, focusing on primary and secondary outcomes, adverse effects and treatment adherence. The baseline characteristics of our participants, including a mean age of approximately 45 years and a slightly higher percentage of males, align with those reported in previous studies, confirming the representativeness of sample.[11] The initial House-Brackmann facial nerve grade averaged around 3.2, indicating moderate facial nerve dysfunction at baseline, consistent with findings from other systematic reviews and meta-analyses evaluating Bell's Palsy treatments.[12] Primary outcome

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 47-51

analysis revealed that combination therapy with corticosteroids and antivirals showed the most significant improvement in facial nerve recovery at all time points. At 1 month, the mean House-Brackmann grade in the Combination group was 2.3, improving to 1.6 at 3 months and achieving near-normal function (1.1) at 6 months. These findings are corroborated by studies demonstrating the efficacy of combination therapy over corticosteroids alone.[13] Conversely, Control group showed the least improvement, maintaining higher mean grades throughout the follow-up period, aligning with evidence indicating the superiority of active treatments over no treatment.[14] Secondary outcomes highlighted the benefits of combination therapy in improving quality of life and reducing pain. The Combination group reported the highest mean Facial Disability Index (FDI) score of 78.5 and the lowest Visual Analog Scale (VAS) pain score of 1.9. These results are supported by previous findings that combination therapy significantly enhances patient-reported outcomes.[4] In contrast, the Control group had the lowest FDI score (70.1) and the highest VAS pain score (3.0), which is consistent with studies showing that lack of active intervention leads to poorer outcomes.[15] Adverse effects varied across treatment groups, with insomnia most common in the Corticosteroids group (10%) and least common in the Acupuncture group (0%). Gastrointestinal issues were most frequent in the Combination group (10%), whereas the Physiotherapy group reported no such issues. These findings are in line with the known side effect profiles of these treatments.[13] Additionally, headaches were infrequent across all groups, with the highest incidence in the Antivirals and Combination groups (6%), reflecting typical adverse event rates reported in the literature.[16]Treatment adherence was high across all groups, with the highest adherence seen in the Control group (95%) and the lowest in the Physiotherapy group (89%). High adherence rates, particularly in control groups, are commonly observed due to the lack of side effects from placebo treatments.[4]However, the high adherence in the active treatment groups suggests good tolerance and patient compliance, which is crucial for the effectiveness of these interventions.Overall, our findings suggest that combination therapy with corticosteroids and antivirals is the most effective treatment modality for Bell's Palsy, significantly improving both objective and subjective outcomes. These results are consistent with existing literature, confirming the added benefit of antivirals when used alongside corticosteroids.[13,14] While adverse effects are a consideration, the benefits in facial nerve recovery and quality of life outweigh these risks, supporting the use of combination therapy as a standard approach in managing Bell's Palsy. Future research should continue to refine these treatment protocols and explore the long-term impacts on patient outcomes, further solidifying the evidence base for these therapeutic strategies.

Conclusion

This study provides a comprehensive comparative analysis of various treatment modalities for Bell's Palsy, highlighting the superior efficacy of combination therapy with corticosteroids and antivirals. The findings demonstrate that this combination therapy significantly improves facial nerve recovery, quality of life and pain outcomes compared to other treatments and control groups. Despite the higher incidence of gastrointestinal issues in the combination therapy group, the overall benefits in enhancing patient recovery and well-being outweigh these risks. These results are consistent with existing literature, reinforcing the recommendation of combination therapy as the standard treatment for Bell's Palsy.

Recommendation

Future research should focus on optimizing treatment protocols and exploring long-term outcomes to further substantiate these findings and improve patient care strategies. Change of symptoms between the combination therapy and control treatment had no significant variation.

Disclosure

Authors declared no competing interest.

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IAHS Medical Journal
Volume 07 Issue 02 December 2024; 47-51

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