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HYPERBARIC OXYGEN THERAPY (HBOT);

AN "ADJUVANT" TO BELL'S PALSY TREATMENT

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ABSTRACT: The role of steroids in the treatment of Bell's palsy is well known provided patients present within 72hrs of symptoms onset. If patients present late or with severe Bell's palsy the effect of steroids or other treatment modalities is not yet clear. Aim of this study was to evaluate the effect of HBOT along with oral steroids in treatment of such patients. **Setting:** Diving department at Armed Forces Hospital King Abdul Aziz Naval Base Jubail, Kingdom of Saudi Arabia (KSA). **Period:** January 2010 to Dec. 2015. **Methods:** Bell's palsy patients of age 13 years and above were treated with steroids & HBOT. Prednisolone 60mg was given orally for one week to all patients & those patients who could tolerate HBOT were selected for treatment with Hyperbaric Oxygen in a closed chamber at 2.5 ATA, 90 minutes a day and five days a week. HBOT was continued till complete recovery or up to 20 sessions before declaring partial recovery or failure. Assessment was done by physician using House-Brackmann grading system for Facial nerve dysfunction. Patients were followed up to 3 months before declaring partial recovery or treatment failure. **Results:** Treatment was started on 125 patients but 15 patients could not tolerate HBOT due to ear pain (10 patients) or high blood pressure (5 patients) in the HBOT chamber whereas 10 patients did not show up for follow up so only 100 patients completed the treatment. Out of 100, 22(22%) patients had mild (grade I to II), 40 patients (40%) had moderate (grade III to IV) and 38 patients (38%) had severe (grade V to VI) Bell's palsy. Majority of patients (85%) presented after 72hrs of symptoms onset. At 3 months of follow up 90% (n=90) patients had full recovery whereas 10% (n=10) patients had partial recovery. Severity of disease (OR 0.125, CI 0.025---0.6255, p =0.00595) and time between onset of symptoms and start of treatment >2weeks (OR 0.0966 CI 0.0187---0.4987, p=0.00280) were statistically significant. **Conclusion:** Combination of Hyperbaric Oxygen therapy and steroids is useful in the treatment of Bell's palsy irrespective of disease severity and time of presentation.

Key words: Hyperbaric Oxygen Therapy (HBOT), Facial Palsy, Bell's palsy, Adjuvant therapy for Bell's palsy.

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INTRODUCTION

Bell's palsy presents as a unilateral weakness or paralysis of the facial muscles due to acute dysfunction of the peripheral Facial nerve with no readily identifiable cause.[1] About 70% of patients with Bell's palsy recover completely within 6 months without treatment. The rest of the patients end up either with residual paresis, contracture or synkinesis of facial muscles.[2]

Steroids are considered as the most effective therapy for Bell's palsy. According to a randomized controlled trial 83.0% of patients recovered in 3 months & 94.4% in 9 months who were treated with steroids.[3] But the patients included in this study presented within 72hrs of symptoms onset and the Bell's palsy was of mild to moderate severity (H.Brackman grade II or III). In addition to steroids many other treatment modalities have been tried but did not prove to be beneficial. For example antiviral treatment given alone or in combination with steroids did not show any additional advantage as stated by many trials and also in a Cochrane meta-analysis done on 7 studies involving 1987 patients conducted between 1966 and 2008.[4,5] Similarly electrical stimulation or surgical decompression of facial nerve has shown conflicting results.[6]

Some studies favor Hyperbaric Oxygen Therapy (HBOT) for the treatment of Bell's palsy.[5,6]

But due to their small sample size and biased methodology these studies provide a weak evidence. Hyperbaric Oxygen Therapy has anti-inflammatory effects, it down regulates the proinflammatory cytokines and up-regulates the growth factors such as transforming and platelet derived growth factors. It also promotes angiogenesis and collagen synthesis thus expedites healing which helps the Facial nerve to recover completely and rapidly.[7,8] Up to our knowledge no study has been conducted to evaluate the effectiveness of combination therapy using HBOT & steroids for the treatment of Bell's palsy The aim of this study was to evaluate the effects of HBOT on Bell's palsy patients taking steroids irrespective of the disease duration and severity.

METHODS

This study was conducted from January 2010 to Dec 2015 with the help of Diving department at Armed Forces Hospital King Abdul Aziz Naval Base Jubail, Kingdom of Saudi Arabia (KSA). This department has three chambers for HBOT and is one of the busy departments in the Eastern Region of KSA. This study was started after approval from local Research & ethical committee and we also recruited Bell's palsy patients referred from other hospitals of the area.

Inclusion Criteria

All Bell's palsy patients aged 13 years and above were included in this study irrespective of disease severity and duration.

Exclusion Criteria

The patients who refused to have chamber treatment or had congestive cardiac failure, obstructive pulmonary disease and allergic rhinitis were excluded from the study to avoid barotrauma and exaggeration of their disease. Immunocompromized patients were also excluded as they could not be started on steroids.

Diving Medicine physician was responsible to explain the patients about the treatment and their enrollment. All patients underwent detailed examination by a General Surgeon, Otorhinolaryngologist, Ophthalmologist and Audiometerist. All enrolled patients were also assessed by a consultant physician to rule out any pulmonary disease or to find out other causes of peripheral Facial nerve palsy. He also graded the severity of disease according to House-Brackmann facial nerve grading system (Table-I)[9] and started steroids (Prednisolone 60mg/day PO for one week.

HBOT Therapy

All patients were treated with Hyperbaric Oxygen in a closed chamber under 2.5 ATA for 90 minute (one session) each day for 5 days a week. Before and after every session patients were assessed by diving physician to find out any harmful effect of HBOT.

Assessment of Recovery

All patients were referred to consultant Physician to assess the recovery either after every 10 sessions of HBOT or if the patients look cured on routine examination after each HBOT session by the Diving physician. Patient assessment was recorded according to House-Brackmann facial nerve palsy grading system. Primary end point was full recovery of patient at any stage of treatment whereas secondary end point was reassessment after 3 months from the start of the treatment. If the weakness of facial muscles or facial pain persisted after 3 months, it was considered as having a partial response or incomplete recovery.

The independent variables were age, sex, severity of disease, time between onset of symptoms and start of treatment and sessions of HBOT.

Statistical Analysis

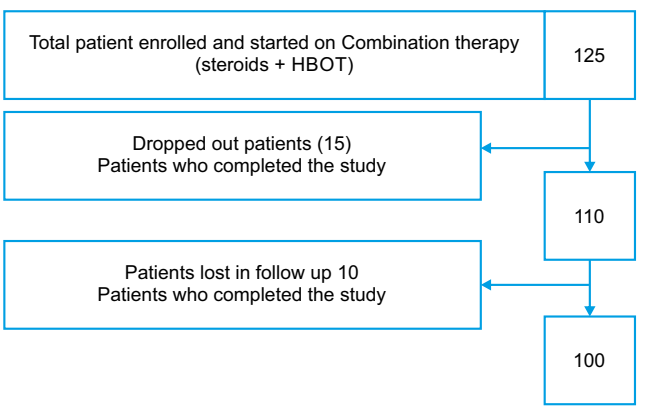
Categorical data was assessed by π^2 test/Fischer Exact Test and numerical data by student t test and P value <0.05 was considered as statistically significant. Logistic Regression Analysis was used to assess the relationship between variables and on line Vassar Stat was used to do Regression Analysis.

Grade	Characteristics	
I-Normal function	Normal function in all areas	
II-Mild Dysfunction	Gross	Slight weakness noticeable on close inspection May have slight synkinesis Normal symmetry and tone at rest.
	Motion	Forehead: Moderate to good function Eye: Complete closure with minimal effect Mouth: Slight asymmetry
III-Moderate Dysfunction	Gross	Obvious but not disfiguring difference between the two sides. Noticeable but not severe synkinesis, contracture or hemifacial spasm. Normal Symmetry and tone at rest.
	Motion	Forehead: slight to moderate movement Eye: Complete closure with effort Mouth: slightly week with maximum effort.
IV-Moderately severe Dysfunction	Gross	Obvious weakness and /or disfiguring deformity Normal symmetry and tone at rest
	Motion	Forehead: none Eye: incomplete closure with effort Mouth: Asymmetric with maximum effort
V-Severe Dysfunction	Gross	Only barely perceptible motion Asymmetry at rest
	Motion	Forehead: none Eye: incomplete closure Mouth: slight movement
VI- Total paralysis	No movement	

Table-I. House-Brackmann Classification of Facial Nerve Dysfunction[9]

RESULTS

125 patients were enrolled and started on oral steroids and HBOT but only 100 patients completed the HBOT therapy as 10 patients were lost in follow up visits and 15 patients could not tolerate the HBOT (10 patients got ear pain and 5 hypertensive patients developed high blood pressure in the chamber).



As shown in Table-II the mean age of patients was 30.6 years (range 13-51 yrs), majority 75 (75%) were males and right sided facial palsy was most common (68%). Milder degree of disease was present in only 22% of patients and the majority (85%) presented after 72 hours of symptom onset. 15 patients were Diabetic and 10 patients were Hypertensive. The majority of patients required 11 to 30 sessions of HBOT.

At 3 months follow up it was found that 90% (n=90) patients fully recovered and only 10% (n=10) patients had partial recovery. The association of disease severity, time between onset of symptoms and the start of treatment and HBOT sessions with complete or partial recovery are statistically significant (p= 0.01282, p= 0.02252 and p= <0.00001 respectively). Data was converted to Binary or dichotomous pattern for Regression analysis.

According to Univariable analysis, severity of disease (OR 0.125, CI 0.025---0.6255, p= 0.00595) and Time between onset of symptoms and the start of treatment >2weeks (OR 0.0966 CI 0.0187---0.4987, p= 0.00280) were statistically significant. But on Multivariable analysis only the Severity of disease was statistically significant (OR 0.1217, CI 0.0231—0.6402, p = 0.0129).

Characteristics		(n=100)
Age (mean 30.6y)	<20 years >20 years	30 70
Sex	Male Female	75 25
Severity of disease	Mild Moderate Severe	22 40 38
Time from symptom onset & Start of treatment	≤ 72hrs 4 to 7 days 8 to 14 days >2 weeks	15 35 20 30
No. of HBOT Sessions	<10 11 to 20 20 to 30	25 50 25

Table-II. Baseline Characteristics of Patients

characteristics	Completely Recovered n=90	Partially Recovered n=10	p value
Age <20 years 20 to 40 years >40	 20 45 25	 5 2 3	.104504
Sex Male Female	 70 20	 5 5	.054292
Severity Mild Moderate Severe	 22 38 30	 0 2 8	.01282
Time between onset of symptoms & start of Treatment ≤ 72 hrs 4 to 7 days 8 to 14 days >2 weeks	 15 34 18 23	 0 1 2 7	.02252
Sessions of HBOT ≤10 sessions 11 to 20 21 to 30	 25 50 15	 0 0 10	<.00001

Table-III.

			Univariable Regression Analysis		Multivariable Regression Analysis	
			Odds Ratio	P value	Odds Ratio	P value
characteristics	**Complete Recovery n=90**	**Partial Recovery n=10**				
Age <20 years >20 years	 20 70	 5 5	0.2857 .0751—1.0863 1.00(Reference)	0.06		
Sex Male Female	 70 20	 5 5	3.5 0.9206—13.306 1.00(Reference)	0.0674		
Severity Severe Non severe(Mild & Moderate)	 30 60	 8 2	0.125 0.025---0.6255 1.00(Reference)	0.00595	0.1217 .0231—0.6402	0.0129
Time between onset of symptoms & start of Treatment ≤ 2weeks >2weeks	 67 23	 3 7	0.0966 0.0187---0.4987 1.00(reference)	0.00280	0.9097 0.2157—3.8373	0.8975

Table-IV.

DISCUSSION

About 70% of patients recover from Bell's palsy without any treatment but it takes about 6 months to have spontaneous recovery and there is always a 30% risk of having permanent residual defect causing cosmetic and functional impairment requiring various plastic surgery procedures for correction.[2,11] Therefore majority of physicians recommend in starting steroids or some other form of treatment. American Academy of Neurology and American Academy of Otolaryngology-Head and Neck Surgery Foundation guidelines stated that steroids are highly likely to be effective and increase the likelihood of recovery of facial nerve function in new onset Bell's palsy.[12,13]

Steroids can reduce tissue edema but have the maximum benefit if started within 72 hours of symptoms onset as recommended by the above mentioned guidelines otherwise they have no affect rather can prove to be counterproductive by delaying healing/regeneration process.[14,15,16,17] But in Hyperbaric Oxygen Therapy (HBOT) the dissolved component of Oxygen in the blood increases. Thus oxygen delivery to the damaged Facial nerve is increased which promotes its regeneration and recovery.[7,8]

In this prospective cohort study we assessed the clinical impact of HBOT for Bell's palsy patients. We nullified the confounding effects of steroids and spontaneous recovery by enrolling all patients irrespective of disease duration and then stopping the follow up at 3 months.

In this study 90% of the patients recovered regardless of disease severity and its duration. While some studies have reported up to 94% recovery rate with HBOT in 19.6 to 34 days but their sample size was small.[5,10,11]

There are certain limitations of this study for example, it is not a randomized controlled trial, patients were not assessed by the same physicians before and after therapy, this might had lead to difference in assessment and can affect the results. As Hyperbaric Oxygen chambers are not available everywhere, so most of the patients have no access to HBOT so it cannot be generalized moreover its cost is unknown.

In conclusion Hyperbaric Oxygen therapy is useful in treating Bell's palsy patients especially those with severe disease or those who present late after start of disease but further studies are required to confirm it and it can only be offered to those patients who can have easy access to the HBOT.

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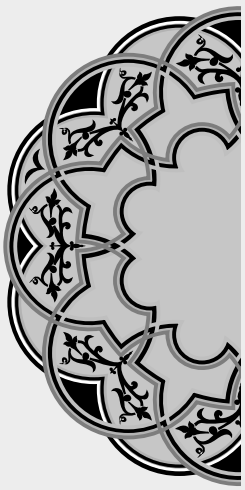

"You'll never find the RIGHT person if you never let go of the WRONG one."

Unknown

AUTHORSHIP AND CONTRIBUTION DECLARATION

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