*Original Article*

# Effect of Infrared Radiation (IRR) on Patients with Bell's Palsy

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**Abstract**

*This prospective study was conducted to determine the effect of Infrared Radiation on the patients presented with Bell's palsy attended at the Department of Physical Medicine and Rehabilitation, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh from January 2012 to June 2012. By dividing in equal two groups 'A' and 'B' (30 patients in each group) a total of sixty (60) patients with Bell's palsy were included in this study according to the selection criteria. Group-A patients were received Infrared Radiation (IRR) including Proprioceptive Neuromuscular Fascilitation (PNF) exercise, Drugs (Prednisolone & Acyclovir) and Counseling for their recovery, where Group- B didn't receive IRR but received rest of management. In Group- A, 25(83.33%) patients recovered completely and among them 12 (40%) patients recovered early (within 2 months). In Group- B, 23(76.67%) patients recovered completely, among them 7 (23.33%) patient recovered early. The difference was statistically significant. The outcome of early recovery is better with the patients treated with combined effect of IRR, PNF exercise and drugs compared with combined effect of PNF, exercise & drugs. The patients who attended with facial nerve paralysis House-Brackmann (HB) Grade IV to VI during initial presentation have reduced chance of full recovery of facial nerve paralysis.*

**Key Words:** Infrared Radiation, Bell's palsy, PNF exercise

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## INTRODUCTION:

Idiopathic facial nerve palsy or Bell's palsy is a common condition affecting all ages and both sexes.1 This common acute isolated facial palsy is usually due to viral (often Herpes simplex ) infection that causes swelling of the nerve in the petrous part of temporal bone and as it traverses the stylomastoid foramen in the skull base.2 Although cause of Bell's palsy is thought to be idiopathic in nature but now-a-days, it is said to be viral in origin.4 There are also some risk factors which may increase the chance of developing Bell's palsy i.e. pregnancy, diabetes, cold or flu, weakened immune system.4,5 In Bell's palsy the nerve become compressed in the facial canal due to swelling and inflammation that is a part of body's reaction to an infectious disease process leading to nerve injury in the form of neuropraxia or axonotmesis.4 Incidence of Bell's palsy is about 20–30/100000/year worldwide.6 In some studies, people with diabetes or hypertension, and pregnant women are more susceptible to peripheral facial paralysis with worse outcome, but this is not seen in all studies.5 The onset of Bell's palsy is acute and about one half of cases attain maximum paralysis in 48 hours and practically all within 3 or 4 days.4 In rare case (1%) it can occur bilaterally - resulting total facial paralysis.7 Most of the Bell's palsy patients recover well. Total recovery is seen in 70–80% of patients overall. With incomplete palsy, the recovery rate is 95–99%, with complete palsy 50–60%.8 Roughly 30% of all patients are left with some sequelae (remaining palsy, hemi-facial spasm, contracture or synkinesis), mainly mild or moderate, but severe in 5% of cases.9 Early treatment (within 3 days after the onset) is necessary for therapy to be effective.4 Steroids have been shown to be effective at

improving recovery by reducing inflammation and antiviral agents may be given to treat viral causes if any.10.11 Antiviral agents are however commonly prescribed due to a theoretical link between Bell's palsy and the Herpes simplex and Varicella zoster virus.11 Vitamins like B1, B6, B12 and Zinc may be given as adjunct therapy which may help with the nerve regeneration.12 Physical therapy is paramount, with the main goal of re-establishing muscle tropism, function and strength to the patients with Bell's palsy.13,14 Infrared radiation is beneficial as it increases circulation and thus reduces oedema. Infrared are those radiation of longer wave length than the red end of the visible spectrum, extending to microwave region, from 770 nm to about 12500 nm.15 The application of infrared produces local vasodilatation of the irradiated part and hence patient get a better circulation which promotes absorption of inflammatory exudates.16 Electrical stimulation therapy (EST) or Transcutaneous electrical nerve stimulation (TENS) may be applied in late case usually after 21 days.17 To increase the strength of facial muscles proprioceptive neuromuscular facilitation exercise and therapeutic massage of facial muscle to reduce oedema is necessary.18 Another treatment used for residual paralysis following Bell's palsy is neuromuscular retraining (NMR). Modalities such as surface EMG, biofeedback and mirror exercises provide sensory information to assist with recovery.19

## MATERIALS AND METHODS:

A randomized controlled trial was conducted on 60 patients by random sampling technique with idiopathic facial nerve paralysis (Bell's palsy) who had attended Dhaka Medical College Hospital from January 2012 to June 2012. Patients of both sexes of 13-40 years features of lower motor neuron type of facial palsy with a duration of 1- 30 days was included in this study. Any associated condition e.g. Diabetes mellitus, Hypertension, Pregnancy and Impairment of taste sensation, Hyperacusis patients were excluded from the study. The severity of idiopathic facial nerve paralysis is graded based on House-Brackmann Grading Scale (HBGS). This grading system is formally adopted as the universal standard reporting facial nerve dysfunction after recommendation by Facial Nerve Disorders Committee of the American Academy of Otolaryngology-Head and Neck Surgery in 1985. The factors are analyzed statistically for their role in affecting the outcome of treatment of idiopathic facial nerve paralysis by using a chi-square test of significance.

Grouping of sample:

(i) Group A:

30 patients were received – Infrared Radiation (IRR) 15 minutes for 15 days+ Proprioceptive Neuromuscular Fascilitation (PNF) exercise + Drugs (Prednisolone & Acyclovir) + Counseling.

(ii) Group B:

30 patients were received – Proprioceptive Neuromuscular Fascilitation (PNF) exercise + Drugs (Prednisolone & Acyclovir) + Counseling.

DATA COLLECTION PROCEDURE:

Sixty Cases of Bell's palsy were identified according to inclusion and exclusion criteria. Each subject was allocated randomly into two groups. Group A was given IRR 15 minutes for 15 days + PNF exercise + Drugs (Prednisolone & Acyclovir) + counseling and Group B was given PNF exercise + Drugs (Prednisolone & Acyclovir) + counseling. All the patients were treated with a combination of steroid and acyclovir. The dosage for acyclovir was 2000 mg/day in divided doses for five days and prednisolone was 1mg/kg for first seven days. All the cases were followed every 15 days interval up to first 3 months and the data was recorded. Study parameters were assessed on the basis of House-Brackmann facial grading scale. Baseline clinical data and relevant investigation was done prior to grouping.

## Results:

**Table- 1: Demographic characteristics among the patients:**

| Characteristics | Group A | Group B |
|---|---|---|
| Age (mean±SD) | 29.1±7.07 years | 28.6±6.65 years |
| Duration (mean±SD) | 08.53±6.65 days | 09.73±5.36 days |
| **Sex** | | |
| Male | 19 (63.3%) | 13 (43.3%) |
| Female | 11 (36.7%) | 17 (56.7%) |
| **Marital status** | | |
| Married | 20 (66.7%) | 20 (66.7%) |
| Unmarried | 10 (33.3%) | 10 (33.3%) |

| | | |
|---|---|---|
| **Occupation** | | |
| Business | 6 (10.0%) | 03 (05%) |
| House wife | 7 (23.3%) | 10 (33.3%) |
| Service | 8 (26.7%) | 09 (30%) |
| Student | 9 (30.0%) | 08 (26.7%) |
| **Side affected of face** | | |
| Left | 15 (50%) | 14 (46.7%) |
| Right | 15(50%) | 16 (53.3%) |

Table- 1 shows that the mean age in group A was 29.1±7.07 years and group B was 28.6±6.65 years. Mean duration was found 8.53±6.65 and 9.73±5 days; Sixty five and hirty six days in group A and B respectively. Male were found 32 (53.3%) and female were 28 (46.7%) among them 40 (66.7%) were married and 20 (33.3%) unmarried. Occupation as housewife, students and service holders were found 17 (28.3%) patient in each where business holders were 09 (15%). Right side of face affected 31 (51.7%) patients and 29 (48.3%) were affected in left side.

**Table- 2: Frequency distribution of improvement score after getting treatment in group A**

| Scale reading | No. of patients in follow –up | | | | | | |
|---|---|---|---|---|---|---|---|
| Grade | Day 1 | 1st FU | 2nd FU | 3rd FU | 4tFU | 5th FU | 6thFU |
| 1 - | - | 4 | 4 | 13 | 14 | 25 | |
| II 5 | 12 | 10 | 14 | 11 | 14 | 3 | |
| III 9 | 3 | 10 | 10 | 4 | - | - | |
| IV 10 | 12 | 4 | 1 | 1 | 2 | 2 | |
| V 5 | 2 | 1 | 1 | 1 | - | - | |
| VI 1 | 1 | 1 | - | - | - | - | |
| Total | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

Table- 2 shows that in group A after three months follow-up all patients were responded to treatment, 25 (83.33%) patients fully recovered and 5 (16.67%) patient's partially recovered. Early recovery (within 2 months) was observed in 13 (43.33%) cases.

**Table- 3: Frequency distribution of improvement score after getting treatment in group B**

| Scale reading | No. of patients in follow –up | | | | | | |
|---|---|---|---|---|---|---|---|
| Grade | Day 1 | 1st FU | 2nd FU | 3rd FU | 4th FU | 5th FU | 6th FU |
| I - | - | - | 1 | 7 | 9 | 23 | |
| II 7 | 7 | 14 | 15 | 18 | 19 | 6 | |
| III 10 | 10 | 10 | 9 | 3 | 1 | - | |
| IV 8 | 8 | 4 | 3 | 1 | - | - | |
| V 4 | 4 | 1 | 1 | 1 | 1 | 1 | |
| VI 1 | 1 | 1 | 1 | - | - | - | |
| Total | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

Table- 3 shows that in group B after three months follow-up all patients were responded to treatment, 23 (80%) patients fully recovered and 7 (20%) patient's partially recovered. Early recovery (within 2 months) was observed in 7 (20%) cases.

**Table- 4: Outcome of treatment after 3 months of follow up by comparison between initial grading with outcome grading in the number of patients.**

| Initial Grade (NO) | Outcome Grade (No) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Grade I | Grade II | Grade III | Grade IV | Grade V | Grade VI | Total |
| Grade II | 12 | | | | | | 12 |
| Grade III | 19 | | | | | | 19 |
| Grade IV | 13 | 5 | | | | | 18 |
| Grade V | 4 | 2 | 2 | 1 | | | 9 |
| Grade VI | | | | 1 | 1 | | 2 |
| Total48 | 7 | 2 | 2 | 1 | | | 60 |

Table- 4 shows after three months follow-up, forty eight (80%) patients fully recovered, twelve (20%) patient's partially recovered. In the group that totally recovered, 12 patients were from HB Grade II, 19 patients were from HB Grade III, 13 patients were from HB Grade IV and 4 patients was from HB Grade V. In the group that partially recovered, 5 patients were from HB Grade IV, 5 patients were from HB Grade V and 2 patients were from HB Grade VI.

Table-5: Outcome of treatment after 3 months of follow up by comparison between group A and Group B

| Group | After three months follow-up | |
|---|---|---|
| | Complete recovery | IIncomplete recovery |
| A | 25(83.33%) | 5(16.77%) |
| B | 23(76.67%) | 7(23.33%) |

Table- 5 shows after three months follow-up, in Group A- 25(83.33%) patients out of 30 shows complete recovery and 5 (16.77%) patient shows incomplete recovery. In Group B, 23(76.67%) patients out of 30 shows complete recovery, among them 7 (23.33%) patient shows incomplete recovery.

**DISCUSSION:**

Sixty patients were diagnosed to have idiopathic facial nerve paralysis (Bell's palsy) in Dhaka Medical College Hospital from January 2012 to June 2012. The average age at diagnosis was 29 years with a range from 13 years to 40 years. Thirty two (53.33%) patients were male and twenty eight (46.67%) patients were female. Thirty-one (51.67%) patients had right sided facial nerve paralysis and twenty nine (48.33%) patients had left sided facial nerve paralysis. The age and sex distribution in this study were comparable with the study done by Sittel C et al in 2000.20

The patients presented in the Department of Physical Medicine and Rehabilitation, Dhaka Medical College Hospital within 1 to 30 days with the average of eight days from the day they noticed the first symptom.

All the patients diagnosed to have idiopathic facial nerve paralysis (Bell's palsy) were graded based on House-Brackmann Grading Scale during initial presentation21. Twelve (20%) patients had House-Brackmann (HB) Grade II, nineteen (31.67%) patients Grade III, eighteen (30%) patients Grade IV, nine (15%) patients Grade V and two (3.33%) patient Grade VI facial nerve paralysis at the day of first visit.

After three months follow-up, forty eight (80%) patients fully recovered, twelve (20%) patient's partially recovered. In the group that totally recovered, 12 patients were from HB Grade II, 19 patients were from HB Grade III, 13 patients were from HB Grade IV and 4 patients was from HB Grade V. In the group that partially recovered, 5 patients were from HB Grade IV, 5 patients were from HB Grade V and 2 patients were from HB Grade VI.

There was no correlation between the laterality of facial nerve palsy with total recovery of facial nerve palsy. 14 (23.33%) out of 60 patients who presented within three days to the hospital fully recovered while 34 (56.67%) patients presented later then three days had fully recovered from Bell's palsy.

Thirty one (100%) out of 31 patients with HB Grade II and III facial nerve paralysis fully recovered while 17 (62.96%) out of 27 patients with HB Grade IV to VI fully recovered. Patients with HB Grade II and III facial nerve paralysis had a better chance of full recovery compared to patients with

HB Grade IV and VI. Literature review quoted the percentage of full recovery of idiopathic facial nerve paralysis was between 70% to 95% depending on the grading system and treatment given by different caretakers. Peitersen showed 71% of patients regained normal function of facial muscles after an idiopathic paresis meanwhile Hato N et al showed 92.5% of patients had full recovery of facial nerve paralysis in their study8, 22. In our study, 80% of patients with different grading of facial nerve paralysis regained normal function of facial nerve.

In Group A, 25(83.33%) patients out of 30 shows complete recovery and 12 (40%) patient shows early recovery (within 2 months). In Group B, 23(76.67%) patients out of 30 shows complete recovery, among them 7 (23.33%) patient shows early recovery (within 2 months).

The study clearly shows that virtually all patients with clinically incomplete paralysis have excellent recovery of facial function independent of the treatment. The effect of Infrared Radiation on Bell's palsy is questionable. On the other hand, in this study, patients receiving the Infra Red Radiation in addition to PNF exercises and drugs show early recovery (43.33%) compared to patients receiving PNF exercises and drugs (20%).From this study it can be said that Infrared Radiation may have some effect on early recovery of Bell's palsy.

**CONCLUSION:**

In conclusion, the available evidence from randomized controlled trials is not yet strong enough to become integrated into clinical practice. Further clinical investigation and research with a larger population of patients is necessary before a more specific diagnostic and treatment regimen of this type can be recommended. In conclusion, additional research is needed to conclusively determine when, how, and if IRR is of benefit to patients recovering from Bell's palsy.

**LIMITATIONS:**

This study has some limitations. Because of small sample size, it was not possible to analyze if the exercises, associated either with or without IRR were effective. Use of photography or video to blind the outcome assessor was not done though it may reduce biasness. Recovery at defined times such as three, six and twelve months of treatment is easier to measure accurately than the time to recovery. Therefore, it requires longer follow-up.

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