

# Effects of Intraorbital Electroacupuncture on Diabetic Abducens Nerve Palsy

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**Key words:** Acupuncture; Diabetic Abducens Nerve Palsy; Diplopia Deviation; Eyeball Movement

Diabetic abducens nerve palsy main symptoms include ocular motility disorders and diplopia. This disease is mainly caused by severe vascular degeneration. It is a serious impact on patient's quality of life and mental health. Currently, there is no effective means of intervention for eye movement disorders and diplopia, the patients could only expect for neural self-repair.<sup>[1]</sup> Our team invented intraorbital electroacupuncture (IEA) therapy to repair abducens nerve affected by diabetes. In the meantime, we applied it into clinical practice and achieved great success.

We observed 74 patients with isolated unilateral diabetic abducens nerve palsy between 2011 and 2014. This trial was registered in the Chinese Clinical Trial Registry (<http://www.chictr.org.cn/index.aspx>), with registration No. ChiCTR-OOC-16010251. All patients have received IEA therapy voluntarily and meanwhile continued to receive blood sugar maintenance treatment and they all in the stable glycemic levels. All patients received IEA therapy once a day and five times every week; we test patients for diplopia and function of eye movement every ten times, the data of max horizontal deviations generated by computerized diplopia test system and the difference value between abducent distances for both eyes were collected.<sup>[2]</sup> The patients' age, sex, course of disease, treatment cycles, treatment duration, and concomitant disease were collected.

There were 47 male among 74 patients treated by IEA. The ratio between different genders is 1.74:1. There is no difference between affected eye, with 44 on the left and 30 on the right. The mean age of patients is 58.9 years, range 43–80 years, indicating older age of onset.

Among the 74 diabetic abducens nerve palsy patients, 53 patients were cured, and 17 patients were effectively

treated, with a cure rate of 71.62% and a total efficacy rate of 94.59%. The median eyeball movement pretreatment was 13 mm and decreased to 0 mm after treatment ( $P < 0.05$ ); and the median diplopia deviation pretreatment was 22.36° and decreased to 1.45° after treatment ( $P < 0.05$ ). All of the 74 patients showed decreases in eyeball movement and diplopia deviation across treatment, suggesting that after each cycle of treatment the symptoms improved compared to the previous treatment cycle. The eyeball movement was sharply decreased and close to the normal range [Figure 1a]. Meanwhile, the diplopia deviation decreased slowly to the normal [Figure 1b]. In the cured patients, the mean number of treatment times was 25, and the whole treatment period was no more than 1.5 months. By Spearman analysis, diplopia deviation and eyeball movement showed positively correlation, the correlation coefficient was 0.789, 0.849, 0.753, and 0.484 at different time courses, respectively. We analyzed the efficacy of patients who were cured and not cured. Efficacy was negatively correlated with the course of disease while positively and significantly ( $P < 0.001$ ) correlated with the number of treatment cycles. The correlations between efficacy and factors including age, gender, and concomitant diseases (such as hypertension, hyperlipidemia, and cerebral infarction) were not significant.

From which, 53 cases of eye movement disorders and diplopia symptoms completely disappeared, with clinical

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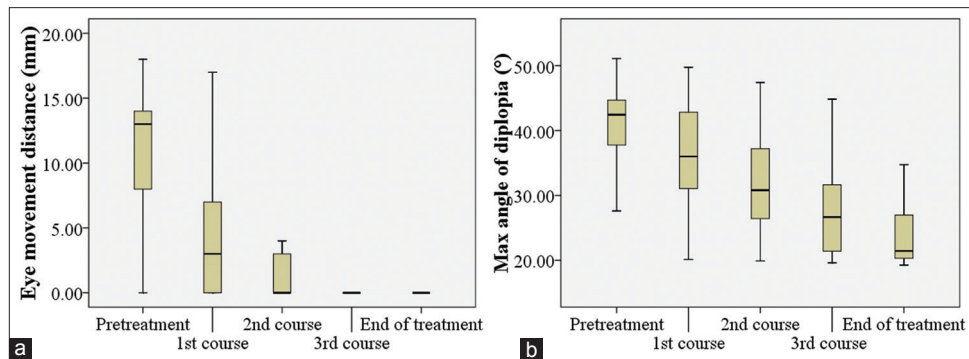
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**Figure 1:** The changes of eyeball movement and diplopia deviation at different treatment time points. (a) The changes of eyeball movement during treatment. (b) The changes of diplopia deviation during treatment.

cure rate of 71.62%. The whole treatment period was no more than 1.5 months. In the previously research, the recovery rate was 57.3%<sup>[3]</sup> and was beginning from 3 months after the first onset.<sup>[4]</sup> Evidently, the whole treatment period was remarkably shorter than conventional method,<sup>[5]</sup> with a significant higher cure rate. The maximal angle of diplopia for the 53 cases is 4.55°, which was close to the normal adult references in our former study.<sup>[2]</sup> It might be used to help with the evaluation of efficacy in the future.

The patients' clinical symptoms were mainly affected by the limited eye abduction and the severity of diplopia. The difference in the eye movement distance during treatment was significantly decreased after the first cycle of treatment, and then, gradually approached to normal. The maximal grade of diplopia also gradually decreased with treatment. These changes were consistent with clinical manifestations of the patients. These finding suggested that the patients still have residual diplopia after the disappearance of eyeball movement disorder before they were completely cured. The analysis of factors affecting recovery showed that efficacy and treatment times were positively correlated ( $P < 0.01$ ). The greater number of treatment cycles, the more likely it was for a patient to be cured. The course of disease was not affected by the efficacy. That may cause by the self-recovery of the diabetic peripheral neuropathy. Among the 74 patients, 50 patients had diabetes with hypertension, accounting for 67.57% of the total; 29 patients had high cholesterol levels, accounting for 39.19% of the total; and 33 patients had cerebral infarction, accounting for 44.59% of the total. Diabetes combined with hypertension had 2.08 times more incidence of abducens nerve palsy than that of diabetes alone. However, these risk factors had no direct impact on the efficacy of this study.

All in all, binocular moving distance difference recovered before the maximal angle of diplopia in patients with diabetic abducens nerve palsy who received IEA therapy. The treatment times had a significant effect on the curative effect.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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