



Case Series

## Case Report: Bell's Palsy and Stem Cell Therapy

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### Abstract

Bell's palsy is the most common form of idiopathic facial paralysis that we see as physicians. We report on a 43-year-old woman with a two-year history of unilateral facial palsy that had stabilized, and was unresponsive to treatment with steroids and antiviral medications. Treatment with adipose-derived mesenchymal stem cells provided a significant improvement in symptomatology with thirty days. Bell's palsy is an idiopathic facial nerve weakness or palsy of 7<sup>th</sup> cranial nerve, thought to be caused by a viral or autoimmune origin. It is the most common cause of facial paralysis, accounting for 50-75% of cases and is part of a differential diagnosis of a cerebrovascular accident. Middle age patients are most commonly affected by the disease process, and it affect both males and females with an equal predilection. Resolution often begins within two weeks, and continues for up to six months. Many, if not most, resolve spontaneously. However, it is not uncommon to see patients with relentless symptoms for 2-3 years extending to 7-10 years. Comorbid factors contribute to the likelihood of onset, and include pregnancy, diabetes, hypertension, Guillain-Barré syndrome, multiple sclerosis, Lyme Disease and myasthenia gravis, to name a few.

### Keywords

Exosomes, Bell's palsy, Mesenchymal stem cells, Monoclonal antibodies

### Introduction

The facial nerve originates from the motor nucleus of the pons. Entering the internal acoustic meatus in the petrous portion of the temporal bone. An arachnoid-lined dura mater sheath encases the nerve, exiting through the stylomastoid foramen. The extracranial distal fivebranches innervate the face distal to the stylomastoid foramen. The intracranial branches provide special sensation to the anterior 2/3 of the tongue, and parasympathetic innervation to the stapedius, the salivary glands, the sinuses, the nose, the palatine nerves and the lacrimal gland amongst others. Thus, paralysis can involve multiple systems of the facial anatomy. There is drooping of the corner of the mouth, inability to close the affected eye, dry eye or epiphora, drooling, sensitivity to sound, pain of the face or behind the ear, inability to taste food and facial tingling. There

are changes of appearance, but the functional abnormalities are usually more debilitating. The facial nerve's anatomical course has led some to believe that the nerve interacts with other anatomical structures along its

path through the bone and soft tissue[1]. Specifically, the nerve is adjacent to the meninges and can develop entrapment neuropathies that can find relief with chiropractic manipulation and treatment[2]. The trapezius and

sternomastoid muscles are supplied by the spinal accessory nerve and are capable of contributing to a Bell's palsy by the proximity of the nuclei of the trigeminal, accessory and facial nerves. Traditional treatment involves antiviral medications within three days of onset, and oral steroids. The immunosuppressive aspect of steroids in this inflammatory process may be the key to resolving the symptomatology. Sadly, many times patients are told that they have to learn to live with the symptomatology. There are reports in the literature of acupuncture utilized within three days of symptom onset, relieving the effects of the palsy or completely curing 100 of 684 cases of facial nerve paralysis[3]. Traditional Chinese medicine oftener commends herbal treatments to supplement and treat facialpalsy[4]. Rubis reported in 2013 that she performed low level laser treatment for Bell's palsy using a Gallium arsenide (GaAs) class 4 laser with a wavelength of 910 nm[5]. An improvement she reports were 70-80% after the first treatment. The use of laser treatment for nerve injury has been reported in the literature with successful results[6,7]. We report a case where adipose derived stem cells were used for precisely this purpose.

### Case Report

A 43-year-old accountant from Nigeria presented with a history of bilateral knee pain for several years' duration due to degenerative joint disease. She was seeking alleviation of her chronic symptoms as she had pain on ambulation that had become progressively worse. She had a history of Bell's palsy for two years which had not responded to treatment. She had received treatment both in Nigeria and United States, including steroids. Because of her failed therapy, she had not sought further treatment. An incidental diagnosis of *Helicobacter pylori* was previously successfully treated. Additionally, there was a history of two C-sections, and hypertension which was well-controlled with spironolactone. She took Synthroid 25 mcg daily and Armour Thyroid for hypothyroidism. Socially she did not smoke cigarettes and did not drink alcohol. She had a history of an allergy to chloroquine.

On physical examination, she was 5'6 tall and weighed 238 pounds. The habitus was pyknic. Left-sided facial drooping was pronounced with incomplete closure of the left eye. She was a House – Brackmann Grade 5, with facial asymmetry at rest. Forehead motion was lacking with slight movement of the left oral commissure.

The abdomen was a type IV, with diastases recti. The old Pfannenstiel scar had healed well except for mild-moderate hypertrophy. There were two hernias present, umbilical and epigastric ventral. The knees had full range of motion, but with mild pain at rest. There was a negative drawer sign, although she had evidence of tri compartmental joint disease of both knees. McMurray's sign was negative. Joint deformities were absent on all extremities. All imaging showed joint space narrowing due to degenerative osteoarthritis.

Mesenchymal stem cells were harvested utilizing the Tulip system to aspirate adipocytes from the abdomen under general anesthesia, as the patient opted to have an elective abdominoplasty at the same

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time. An On-Q pain pump was utilized for pain management with Percocet. Keflex was taken for prophylaxis postoperatively. The aspirate was sent to Advanced.

Therapeutic Lab in New York City for stem cell isolation. Cell counts, as determined by Advanced Therapeutics Lab were 889,000,000, with 94.6% viability. Synchronously 3 mL of stem cells were injected into the tissue around the facial nerve in the preauricular tissue. Intra-articular injections were performed postoperatively on both knees under 1% lidocaine local, with an intravenous drip of mesenchymal stem cells administered synchronously. She received 2 additional injections to the facial nerve for a total of three injections over a period of one month. The second injection was 1 week after the first. The third was two weeks after the second. A treatment protocol had not been established in the literature.

Therefore, this new protocol had to be created. Postoperatively, she recovered from her abdominoplasty/herniorrhaphy uneventfully. The pain rapidly improved in her knees, and she was able to ambulate freely. Much of the symptomatology of the Bell's palsy had resolved within thirty days. The House-Brackmann grade changed from a Grade 5 to a Grade 2.



Figure 1: Prior to Bell's palsy onset.



Figure 2: Two years after onset of symptoms, and prior to treatment.



Figure 3: One-year post-treatment with stem cells.

## Discussion

The true cause of Bell's palsy is unknown, although it has been associated with a number of viruses. Specifically, Epstein-Barr, coxsackievirus, Herpes simplex, Herpes zoster, cytomegalovirus, and rubella, to name a few. The patients are highly self-conscious of the condition. Symptoms are usually short lived, but can last a lifetime. Synkinesis, persistent facial nerve injury and blindness are debilitating complications. We expect immunomodulatory cytokines to be elevated, with high Interleukin (IL)-6, IL-8 and Tumor Necrosis Factor (TNF)- $\alpha$  level. Studies show this to be the case[8].

Liston and Kleid reported the presence of small inflammatory cells from the internal acoustic meatus to the stylomastoid foramen, and a breakdown of myelin sheaths involving macrophages[9]. The neurons overall show inflammation and myelin breakdown. Greco summarized the immunological hypothesis proposed by Aramsky on immune mediated involvement of the myelin[10,11]. Decreased total T cells (CD3) percentages and T helper cells (CD4) have been shown to be decreased by Gorodezky[12]. Vedeler reported normal (CD4) cells in his studies of Bell's palsy[13]. Mesenchymal stem cells (MSC's) respond by increasing IL-4 and IL-10. They in turn support the Helper T cells-2 (TH2), countering the pro-inflammatory Helper T cells-1 (TH1) reducing inflammation. Incomplete recovery may be a result of the demyelination as discussed by Zhang and Greco[4,11].

While many patients begin to recover within two weeks, and complete resolution occurs in six months or less, the length of time required for recovery is dependent on the amount of nerve damage. The recovery may take longer, or may never recover. This particular patient had facial paralysis for two years. The concerning issues are always inability to close the eye leading to corneal ulceration, time to potential recovery and the psychological impact. The ocular complications may require tarsorrhaphy or weights in the lids. Tiemstra refers to the Copenhagen

Facial Nerve Study in his review of Bell's palsy[14]. The study looked at 2570 individuals with Bell's palsy. Function returned to 85% within three weeks. Currently, there is little support for surgical decompression[15]. An argument could be made for no treatment at all. But the dissatisfaction would remain high.

We (the authors) have reported this case of a rapidly improving Bell's palsy, and have previously reported a case of significant improvement of psoriatic arthritis utilizing mesenchymal stem cells[16,17].

## Conclusion

It is our opinion that MSC's and exosomes are extremely useful in diminishing inflammation that are causative or contributory in a number of disease entities. Clearly more research needs to be performed. Although MSC's were utilized in this case, we are confident that exosomes would produce similar results.

## Conflicts of interest

The authors do not have any conflicts of interest in preparation of this manuscript.

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