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Mini Review

Treatment of Trigeminal and Glossopharyngeal Neuralgia: A Comparison between the Outcome of the Microvascular Decompression and the Gamma Knife Radiosurgery

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Abstract

The treatment is variable for the different neuralgias. However there are many techniques that are showing good results, like the Microvascular Decompression (MVD) and the Gamma Knife Radiosurgery (GKS). MVD and GKS are the most used procedures to the trigeminal and glossopharyngeal neuralgia treating when medical treatment has failed. However the MVD provided a higher rate of pain-free outcomes and also resulted in long-lasting outcomes with higher durability than GKS. Besides that the MVD probably is superior to the GKS in achieving and maintaining a pain-free status for both types of neuralgias.

Keywords: *Glossopharyngeal; Neuralgia; Trigeminal; Microvascular Decompression; Gamma Knife*

Introduction

The main symptom of the neuralgias is the pain, that is localized in the distribution of a cranial or cervical nerve. The pain is most often brief, severe, and paroxysmal, but it may occur as a continuous neuropathic pain. The most common neuralgias include the trigeminal and the glossopharyngeal [1].

The trigeminal neuralgia (TN) is characterized by an extreme pain in the distribution of the fifth cranial nerve branches [2]. The pain can be located in one or several territories, depending on the injured branches of the fifth cranial nerve (CN V). The pain has a sudden onset and it is usually unilateral, severe, "stabbing-like" or similar to an electric shock, paroxysmal and last from few second to 2 minutes. Some patients don't describe any trigger for the pain, but most of them refer that the lightest touch on the CN V innervation area or even facial movements can be triggers for the pain. The disease can be caused by various conditions, such as a cerebellopontine angle tumor, multiple sclerosis and vascular compression of the nerve. The vascular compression is the most common cause for the TN accounting for approximately 80 - 90% of the cases. The diagnose is clinical, but the Magnetic Resonance Imaging (MRI) helps to identify the etiology mainly vascular causes. The superior cerebellar artery has been recognized as one of the most important vessels for the genesis of the disease. First line treatment is the pharmacological approach, using the frequency-dependent sodium channel blockers, such as the carbamazepine and oxcarbazepine. The medication dosage must be increased until the pain relief is achieved, but the maximal allowed dose shouldn't be exceeded. When this point is reached and the patient still presenting pain the surgical options should be considered [3,4].

The glossopharyngeal neuralgia (GPN) is usually an unilateral syndrome which the patient often presents with paroxysmal episodes of pain through the auricular and pharyngeal branches of the glossopharyngeal nerve [3,5]. The disease, is more prevalent in patients over 50 years (57%). The GPN it's often caused by the compression of the glossopharyngeal nerve. Neurovascular conflict of the nerve root entry zone or midcistern portion causes demyelination and afferent hyperexcitability of the cranial nerves IX and/or X [3,5]. The pain is well characterized as paroxysmal, of the electrical shooting type, and most times caused by stimulation of the pharynx or deep throat. Patients can experience 30 to 40 episodes of pain daily, usually persisting for less than seconds to 2 minutes. The pain is triggered by chewing, swallowing, or talking. When GPN affects the parasympathetic functions of the vagus nerve patients also can have syncope episodes, bradycardia, asystole and convulsion. The MRI also contributes for the diagnostic process and etiology determination. The pharmacological and many others features are very similar to the TN.

Others neuralgias can be manifested, most of times related with another one, such as the relation between the glossopharyngeal and the vagus neuralgia. The TN can be related with the GPN also. This data can be understood looking for the anatomic conditions, both nerves (IX and X) shares the retro-olivar sulcus as their origin. The descending trigeminal tract is shared by pain fibers of the cranial nerves IX^{th} and X^{th} as the first relay station [6]. Both TN and GPN can be caused by neurovascular compression, what can be seen in figure

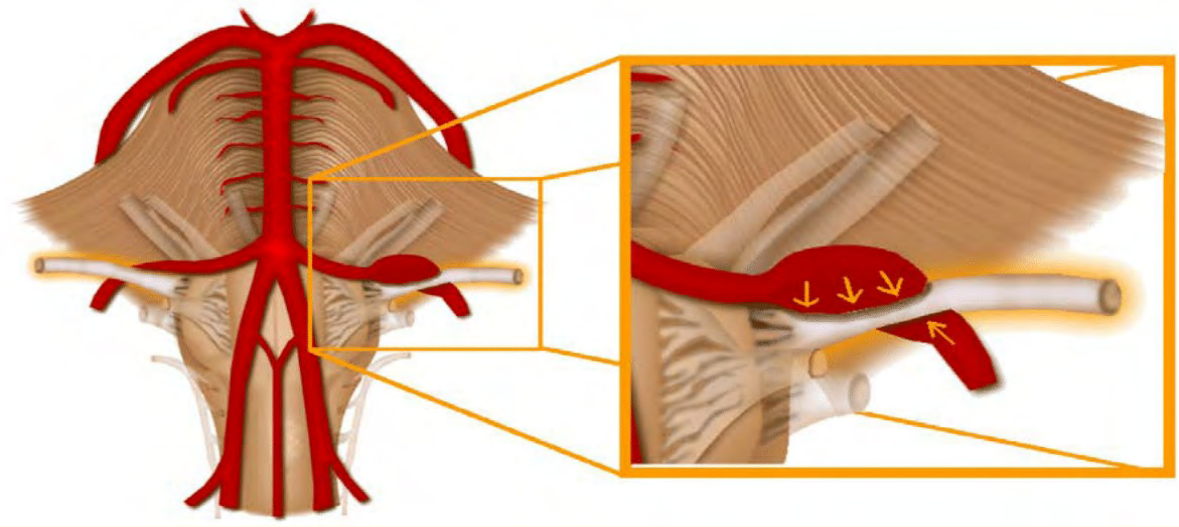

Figure 1: Neurovascular cause for GPN, Ectasia of the Vertebrobasilar system. The figure shows an aneurysm on the anterior inferior cerebellar artery causing compression on the CN IX on its origin.

The treatment is variable for the different neuralgias. However there are many techniques that are showing good results, like the Microvascular Decompression (MVD) and the Gamma Knife Radiosurgery (GKS) [7-13].

Several studies shows that the MVD is the most used procedure due to its better results, like 90% of patients obtains full pain relief [4]. More than 80% of patients will still be pain free at 1 year after the surgery, 73% of patients will remain pain free 5 years post- operatively [4]. There are some complications that can happen due to the procedure, but they have low rates of presentation, such as CSF leak or meningitis being present in almost 4% of the cases, with the ipsilateral hearing loss being the main long-term complication [4]. The average mortality rate associated with MVD is about 0.2% [4]. Reddy., *et al*. [3] described that with 1% of the patient that underwent a MVD presented a hearing loss, 1% had facial numbness and 0.2% died within the postoperative period [3].

The GKS presents high rates of immediate improvement with values of 80% to 90% of patients being pain-free within the first year. However, this value progressively declines to approximately 55% being pain-free at 3 years [3].

Methods

We performed a literature review using PUBMED and Clinical Key. We used glossopharyngeal, neuralgia, trigeminal, microvascular decompression and gamma knife as our key words. The search was limited to the studies published in English, from 2008 to 2018. We raised a total of 30 articles, but only 17 had the data that interested us. We observed the outcome of the microvascular decompression compared to the gamma knife radiosurgery, when applied to patients with trigeminal or glossopharyngeal neuralgia. The articles used to evaluate the outcome, used the Barrow Neurological Institute Pain Intensity Score to establish the outcome. Due to retrospective design of this literature review, we did not apply for ethics committee approval.

Results

Treatment of the Trigeminal Neuralgia

Zachary., *et al*. [7] analyzed 2650 patients that underwent a MVD and 2846 that underwent a GKS. The MVD group presented a higher initial pain-free outcomes rate compared with GKS group (92.22% vs. 61.46%) [7], (100% versus 77.3%) [9], (100% versus 84%) [10], (96% versus 75%) [14]. The MVD group also demonstrated a significantly higher pain-free outcomes rate on the long-term when compared with GKS group (79.37% vs. 41.62%) [7], (80.6% versus 45.5%) [9], (85% versus 45%) [10]. The MVD and the GKS presented a similar pain-free recurrence rate (14.93% vs. 19.38%) [7]. However Takuro., *et al*. [8] and Linskey., *et al*. [9] found that the recurrence rates were higher in the GKS group, 3.35 for patients in the GKS group compared with the MVD group [9], (39% in the GKS group versus 20% in the MVD group) [10]. Confirming that, Takuro., *et al*. [8] found that 6.1% of the patients in the MVD group and 51.9% in the GKS group entered into a "with medication" state, demonstrating that the results achieved with the GKS were "lost" more frequently.

Treatment of the Glossopharyngeal Neuralgia

Among the patients that underwent a GKS procedure, analyzed by Álvarez., *et al*. [15], 60% of them took no medication after the GKS, but the other 40% of them continue with the medication [15]. However the patients analyzed postoperatively by Wang., *et al.* [16] required medication in only 34% of the cases and in 66% of them the symptoms of GPN were relieved immediately after MVD [16]. The patients of Ferroli., *et al*. [6] that underwent a MVD presented a long-term recovery of the pain after surgery in 90.3% of the cases [6], similar to Xia., *et al*. [17] that found an excellent immediately postoperative outcome of 89.5%, and a long-term good outcome in 89,7% of them [17].

All the results comparing the MVD and GKS outcomes can be seen in table 1 and table 2, respectively.

Microvascular Decompression			
Year of study publication	**Number of patients in the study**	**Initial good outcome**	**Long-Term good outcome**
Zachary., *et al*.	2650	92.22%	79.37%
Linskey., *et al*.	36	100%	80.6%
Nanda., *et al*.	20	100%	85%
Ferroli., *et al*.	31	No data	90.3%
Xia., *et al*.	228	89.5%	89,70%

Table 1

Gamma Knife Radiosurgery			
Year of study publication	**Number of patients in the study**	**Initial good outcome**	**Long-term good outcome**
Zachary., *et al*.	2846	61.46%	41.62%
Linskey., *et al*.	44	77.3%	45.5%
Nanda., *et al*.	49	84%	45%
Kondziolka., *et al*.	107	89%	41%
Jung., *et al*.	47	76.60%	No data

Table 2

Discussion

MVD and GKS are the most used procedures to the trigeminal and glossopharyngeal neuralgia treating when medical treatment has failed. However the MVD provided a higher rate of pain-free outcomes and also resulted in long-lasting outcomes with higher durability than GKS. Besides that the rates of no medication use after the procedure are much higher in the MVD group compared with the GKS group [6,8,15-17], so the MVD is probably superior to the GKS in achieving and maintaining a pain-free status for both types of neuralgias [7-11]. MVD group presented a higher initial pain-free outcomes rate, a significantly higher pain-free outcomes rate on the long-term and a lower recurrence rates compared to the GKS [7,9,10,14].

Conclusion

First line treatment is the pharmacological approach, but in cases that the patient do not respond to the treatment, surgical interventions has to be considered, such as the MVD and the GKS. MVD probably is a more effective intervention than GKS due to the higher rates of initial pain-free outcomes, long-term pain-free outcomes and a lower recurrence rates compared to the GKS. Besides that MVD is probably superior to the GKS in achieving and maintaining a pain-free status for both types of neuralgias. So MVD should be the first considered surgical treatment for the TN and GPN, when it's practicable.

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