136 - PAIN EVALUATION IN EXPERIMENTAL MODEL OF RATS MEDIAN NERVE COMPRESSION

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INTRODUCTION

The median nerve compression can occur at different points, generating different names according to the compression point. The most common compressive neuropathy in the upper extremity is the carpal tunnel syndrome. This condition is responsible for substantial annual cost to society in terms of lost productivity and treatment costs (BICKEL, 2010). It is a prevalent condition that affects millions of individuals, causing chronic pain, and thenar atrophy (GUPTA et al., 2004). The syndrome occurs most often between 30-60 years, and is 4-5 times more common in women, involving both the dominant side as the non-dominant. Beyond expressions of pain, numbness and decreased strength, swelling may still occur (CONOLLY; MCKESSAR, 2009).

Any process that increases the volume of the carpal tunnel can lead to an increase in pressure within the channel, directing the median nerve ischemia (LO et al., 2002). The first treatment option is conservative and surgery is recommended when there is failure of this. Are suggested as means of nonsurgical treatment: splint, local and oral steroids, and physical therapy resources (BICKEL, 2010; AROORI; SPENCE, 2008).

Nerve injury may be classified into five grades: grade I lesion (neuropraxia) involves a conduction block with an area of demyelination. The grade II (axonotmesis) involves injury to the axon, with potential for full recovery. The injury is similar to grade III injury axonotmetic, except that there is some degree variable, scar formation in the endoneurium, and then the recovery will not be completely normal. The grade IV is a situation in which the nerve preserving its continuity, but is completely blocked with scar and no chance of recovery. A grade V (neurotmesis) involves a nerve section. The type of injury seen in carpal tunnel syndrome is predominantly grade I, and, when severe, is associated with grade II or III. The symptoms of these patients are related to more dynamic with ischemia than with structural damage of the axon or Schwann cells (MACKINNON, 2002).

Taking into account the large number of people who have frames of nerve compression in the upper limbs, and according to Chen et al. (2010), studies assessing the impact of neuropathic pain in the lower limbs may not always be applied to the upper (or in the event of experimental animals in the hindlimbs with the upperlimbs), because of the different pain pathways. And yet there is a certain gap with respect to pain assessment in models of median nerve compression. The aim of this study was to evaluate the pressure pain in animals subjected to a model of median nerve compression.

MATERIAL AND METHODS

Sample characterization

We used 10 male Wistar rats, with 14 ± 2 weeks old, kept in a photoperiod of 12 h, with food and water ad libitum. The project was conducted in accordance with international standards on ethics in animal experiments (ANDERSEN et al., 2004), being approved by the Ethics Committee on Animal Experiments of Unioeste under protocol number 5610.

Experimental model of nerve compression induction

To perform the compression of the median nerve was used the model presented by Chen et al. (2010), which was based on the model of Bennett and Xie (1988), making ties with chrome wire Catgut 4.0 in four points, with a distance of approximately 1 mm in the median nerve in the region proximal to the elbow. To perform the surgery for median nerve compression, the animals were, prior to the procedure, anesthetized with a solution of ketamine (50 mg/kg) and xylazine (10 mg/kg).

Avaliação da Dor pelo Limiar de Retirada

A dor foi avaliada pelo limiar de retirada do membro ao estímulo mecânico. O equipamento utilizado para realizar o teste de sensibilidade dolorosa foi o Analgesímetro digital tipo Von Frey da marca Insight®, o equipamento consiste em um braço transdutor, com uma ponteira de polipropileno descartável, com capacidade de produzir compressão entre 0,1 a 1000 gramas, ligado a uma caixa amplificadora, medindo a pressão realizada sobre a superfície do animal (NEUGEBAUER et al., 2007).

Os animais foram contidos manualmente e o filamento de Von Frey foi aplicado na região da compressão nervosa. A ponta de polipropileno, do filamento, foi aplicada perpendicularmente à área, com gradual aumento de pressão, e logo que o animal retirou o membro anterior direito, o teste foi interrompido para o registro do limiar de retirada. Houve um tempo de adaptação e treino dos animais de três dias, prévio à cirurgia. Sendo que as avaliações ocorreram diariamente, desde o pré-operatório, até o 8º dia PO.

Pain evaluation by threshold withdrawal

Pain was assessed by limb withdrawal threshold to mechanical stimulation. The equipment used to perform the test of pain sensitivity was the Von Frey type analgesymeter Digital Insight®, the equipment consists of an arm transducer, with a polypropylene disposable tip, capable of producing compression between 0.1 and 1000 grams, connected to an amplifier box, measuring the pressure made on the surface of the animal (NEUGEBAUER et al., 2007).

The animals were restrained manually and the von Frey filament was applied in the region of nerve compression. The tip of polypropylene filament was applied perpendicularly to the area, with gradual increase of pressure, and when the animal withdrew the right forelimb, the test was interrupted to record the withdrawal threshold. There was a time of adjustment and training of animals for three days prior to surgery. Since the evaluations have occurred daily since the pre-operative until the 8th postoperative day.

Data analysis

The results were expressed and analyzed using descriptive and inferential statistics. We analyzed the data normality through the Kolmogorov-Smirnov, and used analysis of variance with repeated measures with Tukey post-hoc, in all cases the level of significance was 5%.

RESULTS

The results obtained in the pressure daily evaluation on the nerve compression site showed, for the control limb (left) no reduction of values to compare with the preoperative or increase in the moments after the first postoperative day, with respect to other (pre-op 122.60 ± 25.50 g, 1 g PO 117.20 ± 28.79, 2 g PO 110.00 ± 26.72, 112.00 ± 3 PO 18.35, 4 PO 138.70 ± 21 , 35g, 5 g OP 126.60 ± 24.07, 6 PO 151.70 ± 25.75 g, 7 g OP 150.20 ± 23.02 and 141.50 ± 8 PO 21.84 g) (Fig. 1).

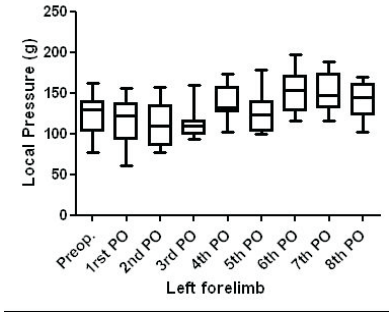

Figure 1 - graphic demonstration of the values of pressure, in grams, within the different stages of evaluation, to the left side, not subjected to compression surgery.

The values found for the side with compression, showed that decreased pain threshold, whereas there was significant reduction steps after pre-operative, but no significant increase when comparing after the first postoperative day (Pre-op 122.50 ± 24.55 g, 1 57.29 ± 13.73 g PO, PO 2 55.76 ± 19.38 g, 3 PO 73.21 ± 13.16, 4 PO 60.84 ± 20.02 g, 63.71 ± 5thPO 20.16 g, 6 PO 79.48 ± 18.41 g, 7 PO 83.83 ± 17.56 g and 8 PO 79.62 ± 22.73 g) (Fig. 2).

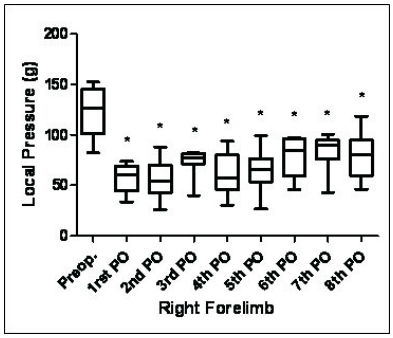

Figura 2 - graphic demonstration of the values of pressure, in grams, within the different stages of evaluation, to the right side, underwent surgical compression. * Statistically significant difference when comparing with the time before surgery.

When comparing sides, there were no significant differences for the time pre-operatively ($p = 0.9825$), but for the moments following, all showed significant differences ($p < 0.0001$).

DISCUSSION

The nerve compression model used in this study was that presented by Chen et al. (2010), which was based on the model of Bennett and Xie (1988), conducting wire cable with 4.0 catgut chrome on the median nerve in the region proximal to the elbow. The above authors noted that the model generates painful symptoms in animals and decreased motor function, but without producing self-mutilation, just protecting the member. Since the form of pain assessment that was used by von Frey filaments, it

was intended in this study to examine whether the behavior would be similar to the use of digitial analgesymeter.In the results we observed, which for the control side, no significant difference in any of the times analyzed, indicating that no change in threshold contra-lateral. There was also a trend of significant increase in pain threshold when comparing the 1st, 2nd and 3rd postoperative day with the 6th postoperative day, and 2nd and 3rd postoperative day with the 7th postoperative day, possibly explained by habituation of the assessment.

According to Chen et al. (2010) the pain starts around the 3rd day and has increased nociception in about the 7th day. In this study, we observed the presence of pain already in the first postoperative day, all of which values, ratings after surgery were significantly lower than the values found preoperatively. Still, there was no increase in the threshold, comparing the time after the first postoperative day, with the following moments. And also to compare between the sides, it was observed that only the time before surgery showed statistically equal, and at all times postoperatively the injured side had a lower threshold.

It read as limitations of the study the lack of a sham surgery group, which was neglected here, the ethical norm in animal experiments to reduce animal use because, according to Chen et al. (2010) the procedure causes pain, then it was intended only to assess such pain differently than the pre-cited authors. Other limitations is the absence of histological and biochemical analysis, which is suggested for future studies. It is observed that such type of compression is effective in producing pain symptoms which can be very useful in the evaluation of treatment methods, thereby assisting in humans to treat diseases such as carpal tunnel syndrome (BICKEL, 2010; GUPTA et al., 2004; CONOLLY; MCKESSAR, 2009), anterior interosseous syndrome, and pronador syndrome, among others (DANG; RODNER, 2009).

CONCLUSION

Thus, it is concluded in this study with surgical compression of the median nerve, there is the presence of the pain, which lasts at least until the 8th postoperative day, without reduction.

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PAIN EVALUATION IN EXPERIMENTAL MODEL OF RATS MEDIAN NERVE COMPRESSION

ABSTRACT:

The median nerve compression can occur at various points, creating substantial annual cost to society. Since there are some shortcomings with respect to pain assessment in models of median nerve compression. The aim of this study was to evaluate the pressure pain in animals subjected to a median nerve compression model. We used 10 male Wistar rats, with 14 ± 2 weeks old. To perform the median nerve compression a model making ties with chrome wire Catgut 4.0 in four points, with a distance of approximately 1 mm in the median nerve in the region proximal to the elbow. Pain was assessed by limb withdrawal threshold to mechanical stimulation. The equipment used to perform the test of pain sensitivity was analgesymeter digital type Von Frey. The animals were restrained manually and the filament applied in the region of nerve compression. The tip of polypropylene filament was applied perpendicularly to the area, with pressure gradual increase, and when the animal withdrew the right forelimb, the test was interrupted to record the withdrawal threshold. There was a time of adjustment and training of animals for three days prior to surgery. Since the evaluations have occurred daily since the pre-operative until the 8th postoperative day. The results showed that for the limb control does not reduce the values to compare with the preoperative or increase in the moments after the first postoperative day. The values found for the side with compression, showed that decreased pain threshold, but no significant increase when comparing after the first postoperative day. It is concluded that surgery with compression of the median nerve, there is the presence of the pain, which lasts at least until the 8th postoperative day, without reduction.

KEYWORDS: pain measurement, brachial plexus neuritis, median nerve.

ÉVALUATION DE LA DOULEUR DANS MODELE EXPERIMENTAL DE COMPRESSION DU NERF MEDIAN DES RATS

RÉSUMÉ

: La compression du nerf médian peut se produire en divers points, la création d'importants coûts annuels de la société. Comme il existe certaines lacunes en ce qui concerne évaluation de la douleur dans des modèles de compression du nerf médian. L'objectif de cette étude était d'évaluer la douleur de pression chez les animaux soumis à un modèle de compression du nerf médian. Nous avons utilisé 10 rats mâles Wistar avec 14 ± 2 semaines. Pour effectuer la compression du nerf médian, nous avons utilisé un modèle faisant câble en fil chromé Catgut 4,0 points en avril, avec une distance d'environ 1 mm dans le nerf médian dans la région proximale au coude. La douleur a été évaluée par seuil de retrait des membres à la stimulation mécanique. Le matériel utilisé pour effectuer le test de sensibilité à la douleur a été analgesymeter numérique de type Von Frey. Les animaux ont été retenus appliqué manuellement et le filament dans la région de compression du nerf. La pointe de filaments de polypropylène a été appliquée perpendiculairement à la zone, avec une augmentation progressive de la pression, et quand l'animal se retire de la patte avant droite, l'essai a été interrompu pour enregistrer le seuil de retrait. Il fut un temps d'adaptation et la formation des animaux pendant trois jours avant l'intervention. Les évaluations ont eu lieu tous les jours depuis la pré-opératoire jusqu'à la 8e jour postopératoire. Les résultats ont montré que, pour le contrôle de l'État ne réduit pas les valeurs à comparer avec la pré-opératoire ou une augmentation des moments après le premier jour postopératoire. Les valeurs trouvées pour le côté avec la compression, a montré que le seuil de douleur a diminué, mais pas d'augmentation significative lorsque l'on compare après le premier jour postopératoire. Il est conclu que la chirurgie avec la compression du nerf médian, il ya la présence de la douleur, qui dure au moins jusqu'à la 8 e jour postopératoire, sans réduction.

MOTS-CLÉS: mesure de la douleur, névrite du plexus brachial, nerf médian.

EVALUACIÓN DEL DOLOR EN MODELO EXPERIMENTAL DE COMPRESIÓN DEL NERVIO MEDIANO DE LAS RATAS

RESUMEN:

La compresión del nervio mediano se puede producir en varios puntos, la creación de costo anual considerable para la sociedad. Puesto que hay algunos fallos con respecto a la evaluación del dolor en modelos de compresión del nervio mediano. El objetivo de este estudio fue evaluar el dolor a la presión de los animales sometidos a un modelo de compresión del nervio mediano. Se utilizaron 10 ratas macho Wistar, de 14 ± 2 semanas de edad. Para lograr la compresión del nervio mediano, se utilizó un modelo haciendo de cable con alambre cromado Catgut 4,0 puntos en abril, con una distancia de aproximadamente 1 mm en el nervio mediano en la región proximal al codo. La valoración del dolor por parte umbral de la retirada a la estimulación mecánica. El equipo utilizado para realizar la prueba de sensibilidad al dolor fue un analgesymeter digitales tipo Von Frey. Los animales estaban atados manualmente aplicada y el filamento en la región de la compresión del nervio. La punta del filamento de polipropileno se aplicó perpendicularmente a la zona, con un aumento gradual de la presión, y cuando el animal se retiró el miembro superior derecho, la prueba se interrumpió para grabar el umbral de retirada. Hubo un tiempo de adaptación y capacitación de los animales durante tres días antes de la cirugía. Puesto que los análisis se han producido desde el día antes de la operación hasta que el 8 º día postoperatorio. Los resultados mostraron que para el control del Estado no reduce los valores a comparar con el preoperatorio

o el aumento de los momentos después de que el primer día del postoperatorio. Los valores encontrados en el lado con la compresión, mostró que el umbral del dolor disminuye, pero no significativamente mayor en comparación después de que el primer día del postoperatorio. Se concluye que la cirugía con la compresión del nervio mediano, está la presencia del dolor, que dura por lo menos hasta que el 8º día postoperatorio, sin reducción.

PALABRAS CLAVE: dimensión Del dolor, neuritis del plexo braquial, nervio mediano.

AVALIAÇÃO DA DOR EM MODELO EXPERIMENTAL DE COMPRESSÃO DE NERVO MEDIANO DE RATOS

RESUMO:

A compressão do nervo mediano pode ocorrer em diversos pontos, gerando custos anuais substanciais para a sociedade. Visto que há certa lacuna com relação à avaliação da dor em modelos de compressão do nervo mediano. O objetivo do presente estudo foi avaliar a dor pressórica em animais submetidos a um modelo de compressão do nervo mediano. Foram utilizados 10 ratos wistar machos, com 14±2 semanas de idade. Para realizar a compressão do nervo mediano, foi utilizado um modelo realizando amarria com fio Catgut 4.0 cromado em 4 pontos, com distância aproximada de 1 mm, no nervo mediano, na região proximal ao cotovelo. A dor foi avaliada pelo limiar de retirada do membro ao estímulo mecânico. O equipamento utilizado para realizar o teste de sensibilidade dolorosa foi o Analgesímetro digital tipo Von Frey. Os animais foram contidos manualmente e o filamento aplicado na região da compressão nervosa. A ponta de polipropileno, do filamento, foi aplicada perpendicularmente à área, com gradual aumento de pressão, e logo que o animal retirou o membro anterior direito, o teste foi interrompido para o registro do limiar de retirada. Houve um tempo de adaptação e treino dos animais de três dias, prévio à cirurgia. Sendo que as avaliações ocorreram diariamente, desde o pré-operatório, até o 8º dia PO. Os resultados obtidos mostraram que para o membro controle não houve redução dos valores ao comparar com o pré-operatório, nem aumento dos momentos seguintes ao 1º PO. Os valores encontrados para o lado com compressão, mostraram que houve diminuição do limiar doloroso, mas, não houve aumento significativo ao comparar após o 1º PO. Conclui-se que com a compressão cirúrgica do nervo mediano, ocorre a presença de quadro álgico, o qual dura pelo menos até o 8º dia PO, sem diminuição do mesmo.

PALAVRAS-CHAVE: medição da dor (pain measurement, dimensión Del dolor), neurite do plexo braquial (brachial plexus neuritis, neuritis del plexo braquial), nervo mediano (median nerve, nervio mediano).