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Research Article

EVALUATION OF PRESSURE PAIN THRESHOLD FOR *MARMA* THERAPY USING PRESSURE ALGOMETER: A SURVEY STUDY

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ABSTRACT

Marma Chikitsa is a gem of Ayurveda, a non-invasive therapy in which a very gentle stimulation of *Marma* points is done to instigate the flow of *Prana* which was occluded due to disturbed flow of *Vata*. To perform this therapy, a particular amount of pressure is to be applied on the specific *Marma* point. This study is being conducted to assess the pressure pain threshold of value of *Marma* in healthy individuals. Pressure pain threshold, was measured accordingly by a device called "Pressure Algometer" on *Rujakara Marma* i.e., *Manibandha*, *Kurchashira* and *Gulpha* for left as well as right side. The pressure was applied by algometer at two sites that is, at the centre point of *Marma* and other on the periphery of the *Marma*, within the range of *Pramana* of *Marma* (according to the *Pramana*, as described in the text). Time duration for the procedure on a particular *Marma* will be from the skin surface contact with algometer till Grade 2 of pain scale (VAS) and the reading of algometer will be recorded for each *Rujakara Marma* in a particular volunteer. The results are recorded and shared in this article.

INTRODUCTION

Marma Chikitsa

In *Marma Chikitsa* a very light stimulation of *Marma* points on the body is done. *Marma* points when gently pressed on the skin can stimulate chain of flow of *Prana* which were obstructed due to disturbed flow of *Vata*. *Marma Chikitsa* is non-invasive therapy with instant and long-lasting results. *Marma Chikitsa* can make the treatment easy without any medicinal use.

Pain Threshold

The point where a stimuli begin to produce a sensation i.e., pain, the lower limit of perception of a stimulus is called pain threshold. It can be described in many ways as- "A minimal stimulus, eliciting a motor response. The lower limit of a stimulus, capable of producing an impression upon consciousness or of evoking a response in an irritable tissue."

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The threshold for feeling pain are remarkably constant from individual to individual i.e., peripheral receptor of sufficient intensity will reproducibly cause pain at the same level in most people. The response of the individual and his tolerance to pain will however differ markedly between individuals and his response is measured in terms of pain threshold. Pain threshold is measured by an instrument known as Algometer. Pressure algometry is usually prescribed in various medical facilities and gives a valid and reliable measure of localised pain to muscles, joints, tendons, ligaments and bones. Pressure pain threshold has an international system of unit kilopascal (kPa).

Pressure therapy in *Marma Chikitsa* or stimulation

In traditional *Marma* therapy, the pressure applied is measured in terms of *Ghana*.[1]

- Pressure up to the skin and fascia- ½ *Ghana*
- Pressure up to muscles -3/4 *Ghana*
- Pressure much deeper -1 *Ghana*

1) Friction- (*Gharshana*)- To perform this on *Marma* strokes through fingertips or thumbs are applied, either alone or the adjacent finger also takes part in the process.
This type is done generally to stimulate the local circulation.

2) **Kneading (*Peedana*)-** In this massage the underlying structures of the tissues are pressed. This technique is performed in circular motion. The whole hand, finger and thumb tips or finger and thumb pads all make a contribution in kneading.
   In *Marma* grade I of kneading should be done, which is sufficient to influence superficial vessels and compress superficial tissues on underlying structures. Thus, *Avapidanam* technique can be used.
3) **Wringing/twisting (*Udveshtana*)-** In wringing the tissues are compressed against underlying structures, then one hand pulls towards the physician while other hand pushes away. Fingers and thumb can be used in wringing, with tissues compressed between them.
   Grade I is usually applied by finger strokes.
   Grade II uses the whole hand.
4) **Stroking (*Trasana*)-** Fingers and palms are used for this method by giving more or less pressure.
   a) **Digital stroking-** Very gentle massage to stimulate bony prominence, preferably done by using tips of fingers.
   b) **Palmer stroking-** Palms of hand should be used on the borders of the muscles of thigh, calf and buttocks.
   c) **Knuckle stroking-** By using back of fingers this stroke is given mainly where complicated muscles are there like chest and back.
5) **Percussion/tapotement (*Praharana*)-** In this type, the muscles or the body part is stroked by using the fingers or the palms of both hands. This can be done by hacking, clapping, beating and pounding and vibrations gently.

Joint movements (*Sandhi Chalana*)- In this type the joints are moved and are massaged also.

MATERIALS AND METHODS

Study Design

- 200 healthy volunteers, aged group between 20-40 years and of either sex were randomly selected for the survey from the N.I.A. Jaipur campus.
- After getting the informed consent, the health condition of the participants were reassessed to ensure their participation in the study.
- Each volunteer was explained about the study and each of them was provided with the specially designed proforma.
- The first section of proforma covered the basic information about the participants.
- The other section of proforma contained the readings of pressure pain threshold of *Rujakara Marma* of the person.

Pressure Pain threshold was measured accordingly by a device called "Pressure Algometer"[2] on *Rujakara Marma* i.e., *Manibandha*, *Kurchashira* and *Gulpha* for left as well as right side. The pressure was applied by algometer at two sites that is, at the centre point of *Marma* and other on the periphery of the *Marma*, within the range of *Pramana* of *Marma* (according to the *Pramana*, as described in the text).

Time duration for the procedure on a particular *Marma* will be from the skin surface contact with algometer till Grade 2 of pain scale (VAS) and the reading of algometer will be recorded for each *Rujakara Marma* in a particular volunteer.

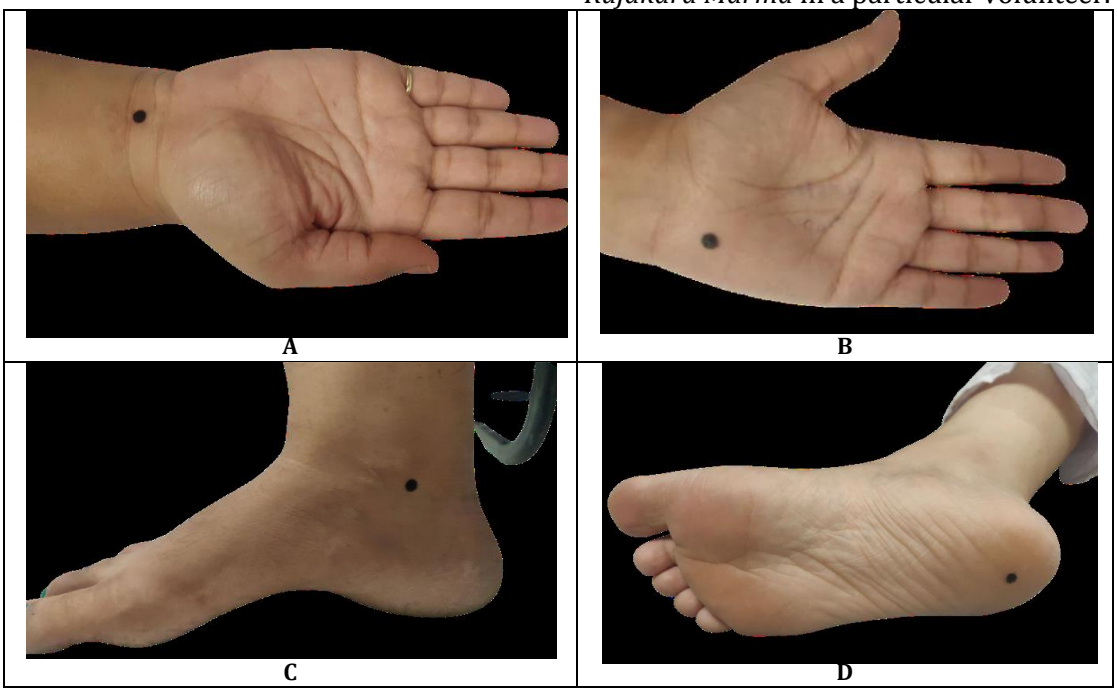


Fig. 1 Showing the location of *Manibandha marma (A), Kurchashira marma* in upper limb *(B), Gulpha Marma (C), Kurchashira Marma (D)* in lower limb

AIM

To assess the pressure pain threshold value of *Rujakara Marma* in healthy individuals.

OBJECTIVES

- Quantitative estimation of stimulation for *Marma* therapy on *Rujakara Marma*.
- Through this pressure application technique, the periphery of the particular *Marma* can be assessed with reference to *Pramana*[3] of *Marma*, as mentioned in the text.

Informed Consent: The study was explained clearly to the subjects and their signed, written informed consent was taken before starting the trial.

Table 1: Evaluation of Pressure Pain Threshold by Algometer on *Rujakara Marma* Right side and Left side

S.No	Name of *Marma*	Range of Pain Threshold	
		At centre point	At periphery
1	***Gulfa***		
2	***Manibandha***		
3	***Kurchashira* (Upper Limb)**		
4	***Kurchashira* (Lower Limb)**		

Inclusion Criteria

- Healthy individuals[4]
- Age: *Madhyamavastha* from *Vriddhi* to *Poornata* according to *Sushruta*[5] i.e., 20-40 years.
- Sex: Male/Female
- Not dependent on any kind of allopathic medicines or drugs.

Exclusion Criteria

- Pregnancy
- Any previous surgical/medical history related to the site of *Rujakara Marma.*
- Person with history of ATT course.

Withdrawal Criteria

- If during the course of application of instrument, any kind of unwillingness or discomfort shown by the volunteer.
- He/she wants to withdraw from the trial.

Assessment Criteria

- Pressure algometer to measure pressure pain threshold value.
- Visual Analogue Scale for assessment of pain.

Pressure Algometer

In this study a digital algometer was taken, due to its high accuracy. The gauge is a hand held force gauge with measuring units of Newton N, Kg kilogram and Lb pound. The unit chosen for study was N. The tip with a radius of 0.5cm was placed over the point of *Marma* and a steady gentle pressure is applied the volunteer was asked to tell when a mild sensation or discomfort was induced. A reading is made and recorded; this represents the patient's pressure pain-threshold for the examined area. This reading was then converted into kPa, since the S.I. unit of pressure pain threshold is kPa.

Fig. 2 Showing Pressure Algometer instrument

Visual Analogue Scale: VAS is most common and useful measure for assessment of pain. It consists of a horizontal line, usually 100mm long. At each end is the term of reference for the patient, called an anchor. The left anchor is usually "no pain" and the right "worst pain." Pain rating is can also be done according to patient's facial expression. In this study dealing with *Rujakara Marma*, it took microseconds and the scale of 1 was taken as the upper limit. Immediately at this point the algometer was stopped and the reading was noted.

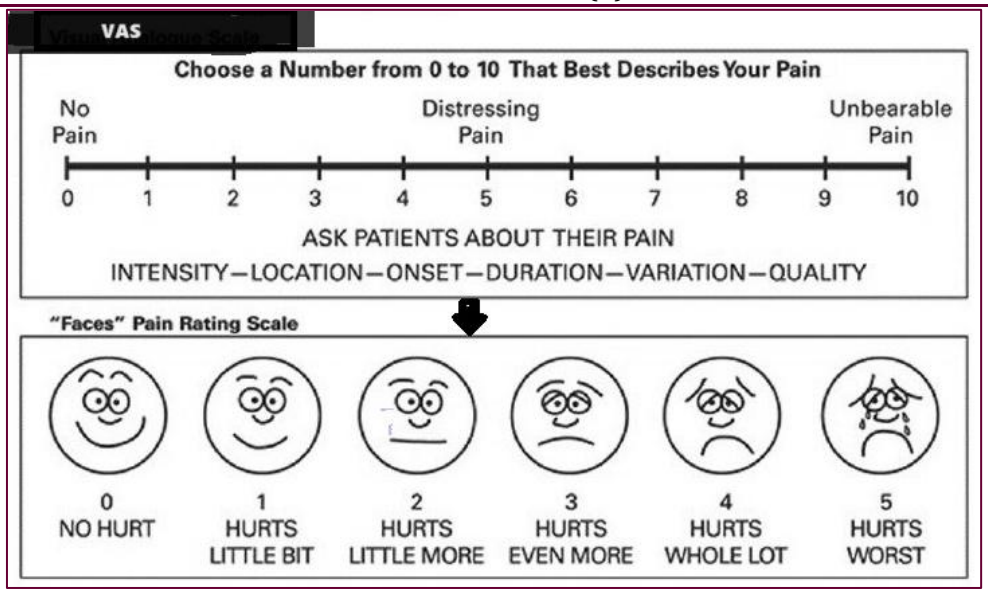


Fig. 3 Showing visual analogue scale

Statistical Analysis

All the calculations were calculated through SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. Statistical tests used are-

Unpaired t test, **ANOVA**, **Chi-square test**, **Fisher's Exact Test**

RESULTS

Upon getting the statistical analyzed result by

- All the results were analyzed using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program.
- Descriptive statistics included computation of percentages, mean and standard deviations. The unpaired t test (for quantitative data to compare two independent two groups).
- Analysis of variance (ANOVA) [for quantitative data within three groups] was used for quantitative data comparison of all clinical indicators.
- Chi-square test and fisher exact test were used for qualitative data whenever two or more than two groups were used to compare.
- Level of significance was set at $P \leq 0.05$.

Table 2: Showing Left Side And Right Side Wise And Common Pressure Pain Threshold (P.P.T.)

	Minimum	Maximum	Mean	Std. Deviation
Right	101.43	343.95	229.586	38.02
Left	100.32	328.82	216.06	33.65
Combined	105.26	313.14	222.82	30.05
Age	20.00	39.00	25.05	5.304

Fig. 4 Showing Left Side and Right Side Wise and Common P.P.T.

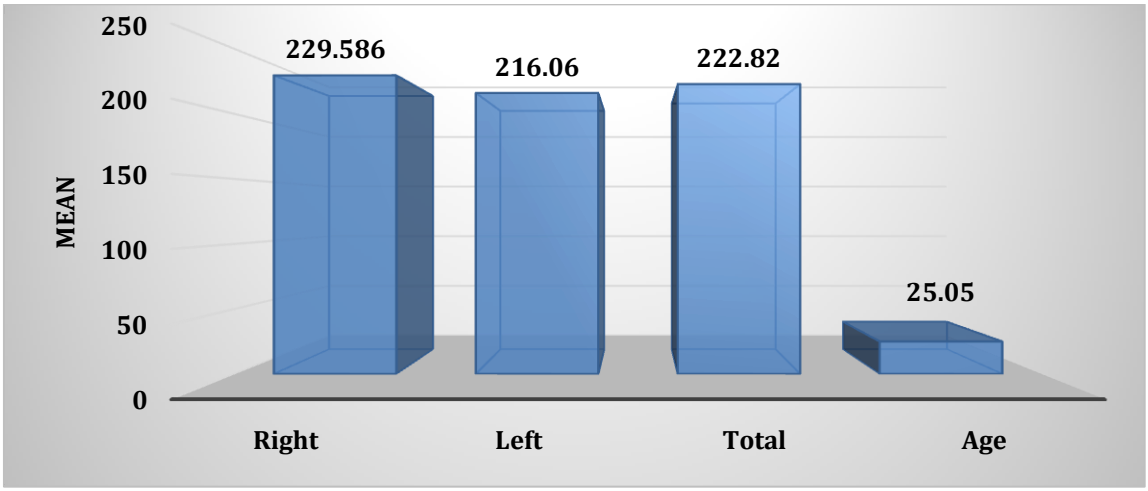


Table 3: Showing the Resultant P.P.T. of *Gulfa, Manibandha, Kurchshira,* Upper limb, Lower limb, Central Point of *Marma*, Peripheral Part of *Marma*

	Minimum	Maximum	Mean	Std. Deviation
Gulfa	84.40	491.40	239.613	49.42
Manibandha	109.24	332.48	221.72	41.504
Kurcashira	79.62	290.29	212.705	32.42
Upper limb	109.72	295.23	217.94	29.90019
Lower limb	79.46	351.92	227.71	37.44
Central	91.09	393.32	235.36	45.61
Peripheral	104.46	401.92	229.89	41.44

Fig. 5 Showing The Resultant P.P.T. of *Gulfa, Manibandha, Kurchshira,* Upper limb, Lower limb, Central Point of *Marma,* Peripheral Part of *Marma*

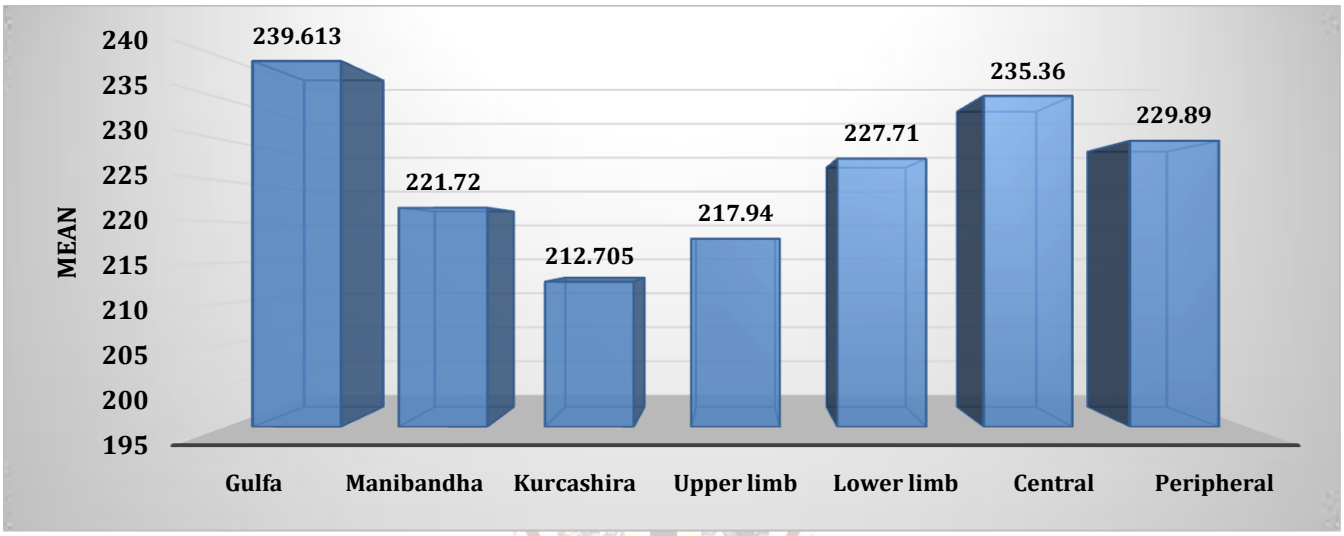


Table 4: Showing P.P.T. According to *Marma*

	Minimum	Maximum	Mean	Std. Deviation	P value
Gulfa	84.40	491.40	239.613	49.42302	0.001 (S)
Manibandha	109.24	332.48	221.72	41.50459	
Kurcashira	79.62	290.29	212.705	32.42274	

Fig. 6 Showing P.P.T. According to *Marma*

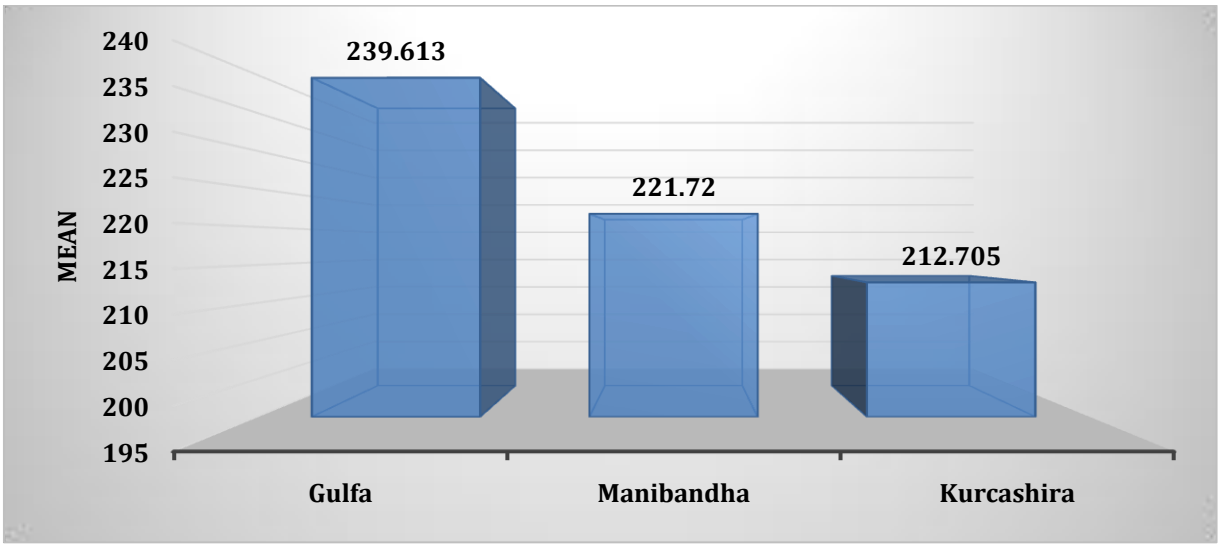


Table 5: Showing P.P.T. According to Upper and Lower limb *Marma*

	Minimum	Maximum	Mean	Std. Deviation	P value
Upper limb	109.72	295.23	217.94	29.90019	0.004 (S)
Lower limb	79.46	351.92	227.71	37.44719	

Fig.7 Showing P.P.T. According to Upper and Lower Limb *Marma*

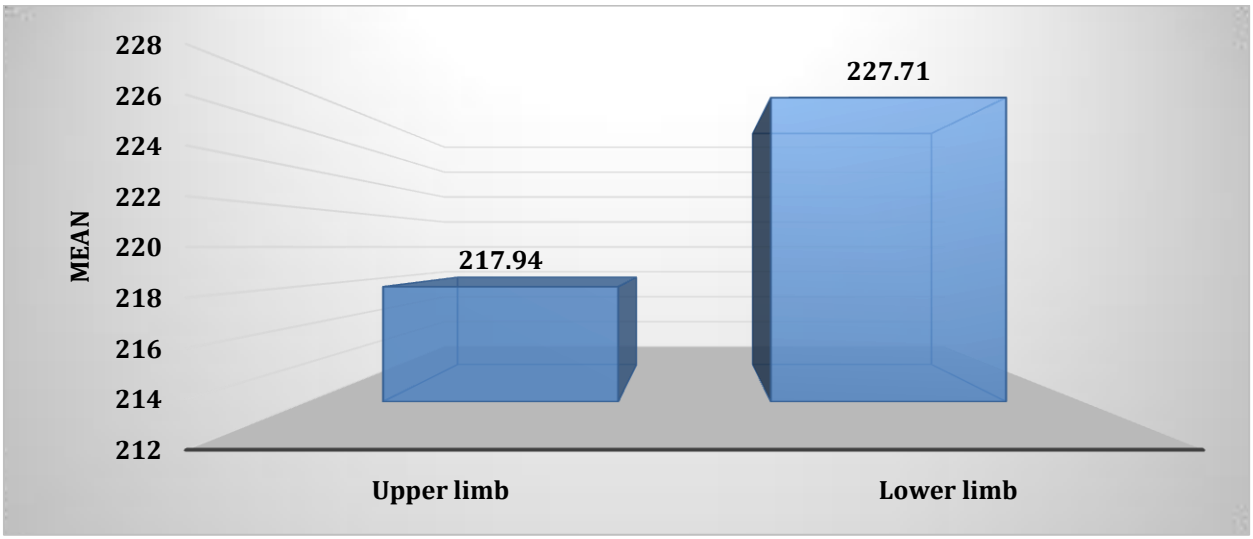
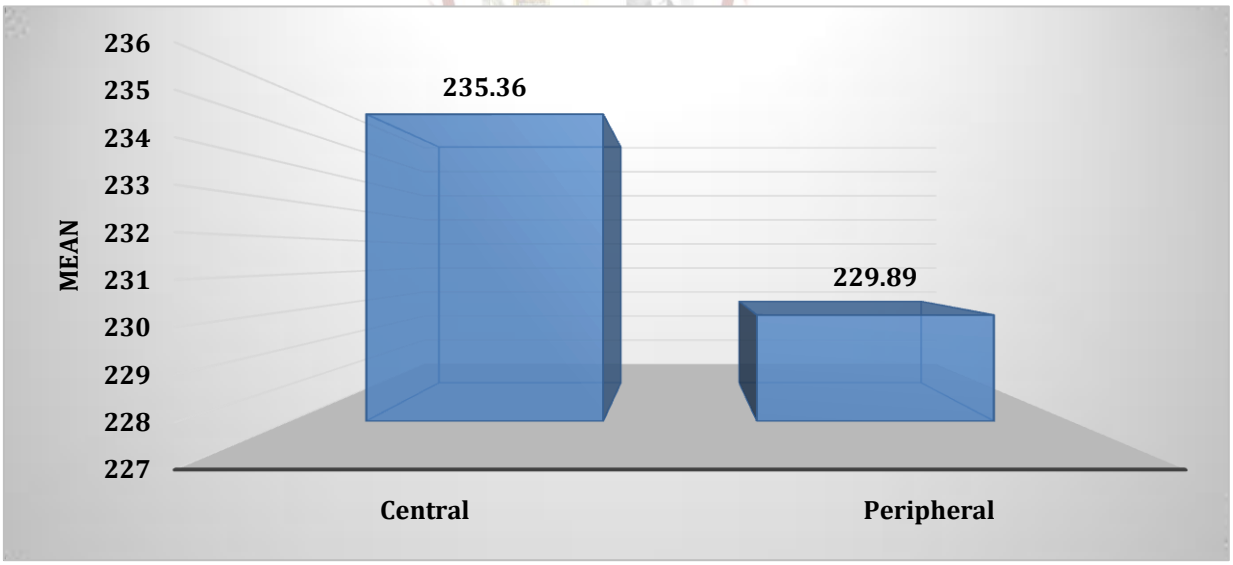


Table 6: Showing P.P.T. on the Centre vs Periphery of *Marma*

	Minimum	Maximum	Mean	Std. Deviation	P value
Central	91.09	393.32	235.36	45.61835	0.21
Peripheral	104.46	401.92	229.89	41.44820	

Fig. 8 Showing P.P.T. on the Centre vs Periphery of *Marma*



- **A general range of Pressure Pain Threshold (P.P.T.) for *Rujakara Marma***

  The range of pressure pain threshold found in *Rujakara Marma* was 105.26 kPa – 313.14 kPa.

  This result was statistically significant ($p<0.05$).

- **Effect of an individual *Marma* on P.P.T.**

  The *Gulfa, Manibandha* and *Kurchashira* were analysed and showed a statistically significance on P.P.T.

  Here, *Gulfa Marma* had a highest P.P.T. (239.613 kPa) whereas *Kurchashira Marma* had lowest (212.705kPa). *Manibandha Marma* had P.P.T. of 221.72kPa.

- **Effect of the site of limb on P.P.T**.

  The *Rujakara Marma* of lower limb were found to have a higher P.P.T. (227.71kPa) as compared to those of upper limb (217.94kPa). This result was statistically significant.

- **Effect of *Marma* site on P.P.T.**

  It was found that there was no statistical significance in difference of P.P.T. on the centre and peripheral part of *Marma* within its *Pramana.*

DISCUSSION

This study was also undertaken to understand the basic concept, substantiate and identify the location and structures in *Marma. Marma* are 107 in number including both hands, both legs left and right side of trunk, left and right side of back. *Rujakara Marma* are the areas where any injury causes pain and this is due to minimum tissue damage. *Rujakara Marma* are *Manibandha, Gulpha*, and *Kurchasira* in hand and in leg in total 8 in number. These areas are more dynamic and highly mobile in function and often prone to injury in day to day activities. They constitute joint and ligaments. Any injury leads to disruption in the supporting ligaments and gives rise to pain as the first symptom. This phenomenon was the basic tool by school of *Sushruta* to classify *Marma* on the basis of result of the lethal aspect. All the tissues such as *Mansa, Sira*, *Snayu, Asthi, Sandhi* carry nocieceptor which is a biological sensor that is related to noxious stimuli. This stimuli is a result of mechanical (direct trauma) biological irritation or thermal. The nociceptive receptors are specialized nerve endings in skin and deep tissues. These receptors are activated at high threshold by a range of potentially damaging stimuli. This reveals that school of Sushruta related the nociceptive pain, a criteria for *Rujakara Marma*. There are eight *Rujakara Marma*, and these are comparatively of a higher nociceptive pain- threshold. The anatomical structures of *Rujakara Marma* carry one or more than one type of sclerotogenous tissue like *Manibandha* (wrist joint) and *Gulfa* (ankle joint) carry abundant ligaments and *Kurch Shira* constitutes largely tendons and all these have sclerotogenic pain receptors having high pain threshold.[6] *Rujakara Marma* can be assessed and is safer and reversible in lower limits, for the study, than other *Marma.*

After statistically analyzing the data various inferences were noted, as mentioned in the result sections. The explanation of the trends of results is as follows-

General pressure pain threshold of *Rujakara Marma*

This value came out to be 105.26kPa – 313.14kPa.

The algometer readings were noted in 'Newton', but the S.I. unit of pressure pain threshold is kPa (kilopascals). Therefore, the readings were converted in kPa and a standard value was noted in a range. To understand this, we can compare-[7]

5kPa	Blood pressure fluctuation (40mmHg) between heartbeats for a typical healthy adult.
9.8kPa	Lung pressure that a typical person can exert.
101.325kPa	Standard atmospheric pressure for earth sea level
150->550kPa	Impact pressure of a fist punch.

As, the result value comes under this range itself. Thus, beyond this range, according to study the pressure on *Rujakara Marma* may move towards the fatality aspect. They are within the scientifically proven range of punch pressure which being a blunt physical, having a large area, making the pressure slightly lower. This range can be a safer range to practice *Marma* therapy.

a) Pressure pain threshold of *Rujakara Marma* with respect to upper and lower limb

The pressure pain threshold, of *Rujakara Marma* was significantly greater in lower limb *Marma* as compared to the upper limb *Marma*. The *Manibandha* and *Kurchashira* of upper limb were more sensitive to pain than the *Gulfa* and *Kurchashira* of the lower limb.

b) Pressure pain threshold of *Rujakara Marma* with respect to centre and periphery

The *Pramana* of was aptly stated by Maharishi Sushruta, this was of a great importance to the surgeons. So the exact size and extent covered by the *Marma* was given denoting that the area will behave as a particular *Marma*. This was measured in terms of *Angula* or *Swangula Pramana*, that is the persons own fingers. However it was not told whether it is the depth or surface. Therefore, on taking the surface, the *Rujakara Marma* on the center and periphery of *Marma*, did not show any significant change. Thus, it suggested that, despite of the center or peripheral part. The *Marma* will have same pressure pain threshold within the *Pramana* of *Marma.* Here, *Manibandha* and *Gulfa* are 2 *Angula Pramana* whereas *Kurchashira* is *Eka Angula Pramana.*

c) Pressure pain threshold of *Rujakara Marma* with respect to the *Marma*

On comparing the individual *Marma*, it was noted that there was a statistical significance with pressure pain threshold. *Gulfa* had the highest pressure pain threshold, then *Manibandha* and then the *Kurchashira*, the lowest. This can be observed as, *Gulfa* being the *Adhoshakha Marma*, and as previously said that lower limb is less sensitive than upper limb. Its stability, structure and function make it lesser sensitive than its homologous, wrist joint.

Kurchashira on the other hand, being a *Snayu Marma*, makes it more painful, easily inflamed as compared to the *Sandhi Marma (Gulfa* and *Manibandha*).

CONCLUSION

The range of pressure pain threshold found in *Rujakara Marma* was 105.26kPa – 313.14kPa. The pressure pain threshold, of *Rujakara Marma* was significantly greater in lower limb *Marma* as compared to the upper limb *Marma*. The *Manibandha* and *Kurchashira* of upper limb were more sensitive to pain than the *Gulfa* and *Kurchashira* of the lower limb. However, the *Rujakara Marma* on the center and periphery of *Marma*, did not show any significant change.

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