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The Addition of SNAGS is Faster to Reduce Pain and Disability Comparing with Conventional Therapy Only among HNP Lumbar Grade I and II

Asrul Sani¹, Susy Purnawati^{2(CA)}, Sugijanto³, DPG Purwa Samatra⁴, IPG Adiamika⁵, IG Ayu Widianti⁶

¹Postgraduate Student of Sport Physiology, Faculty of Medicine, Universitas Udayana, Indonesia; asrulsani494@gmail.com

^{2(CA)}Faculty of Medicine, Universitas Udayana, Indonesia; s_purnawaty@yahoo.com (Corresponding Author)

³Department of Physiotherapy, Universitas Esa Unggul, Indonesia; sugijanto.tea@gmail.com

⁴Faculty of Medicine, Universitas Udayana, Indonesia; purwa_samatra@unud.ac.id

⁵Faculty of Medicine, Universitas Udayana, Indonesia; ipgadiatmika@unud.ac.id

⁶Faculty of Medicine, Universitas Udayana, Indonesia; widianti@unud.ac.id

ABSTRACT

Herniated nucleus pulposus is a rupture of the annulus fibrosus intervertebral disc which can compression the excitatory tissue of the lumbar that comes out of the intervertebral foramen, causing radicular pain, and ultimately causing lumbar disability. This study aims to prove that the addition of SNAGS to conventional therapy is faster in reducing pain and disability in grade I and II lumbar HNP. This research was an experimental study with a control times series design which was carried out at dr. La Palaloi Hospital, Bhayangkara Hospital and Inggit Medical Clinic Makassar. The population was 50 samples with each group consists of 20 people according to pocock formula and each group had given 2 times exercises a week for 6 weeks, simple random sampling using consecutive sampling method with lottery technique. The primary outcomes measured were pain and disability used VAS and ODI that were performed every week. Data analysis using Kruskal-Wallis and Wilcoxon showed the change in the mean VAS before the intervention was 5.84 ± 1.17 and the mean VAS after the third week of intervention was 4.90 ± 1.04 with p -value = 0.000 and a change in the mean The ODI before the intervention was 40.60 ± 9.21 and the mean ODI after the fourth week of intervention was 32.90 ± 6.79 with p -value = 0.0000. While the treatment group showed a change in the mean VAS before the intervention was 5.68 ± 1.00 and the mean VAS after the second week of intervention was 4.57 ± 0.79 with p -value = 0.000 and change in the mean ODI before intervention was 40.50 ± 8.43 and the mean ODI after the third week of intervention was 28.60 ± 6.23 with p -value = 0.000 which means that the control group was effective for changes in pain in the third week and effective for changes in disability in the fourth week, while the study group was effective for changes in pain in the second week and effective for changes in disability in the third week. There was a significant difference in pain changes in the control group and the treatment group in the second week with p -value = 0.014 and a significant difference in the change in disability in the control group and the treatment group in the third week with p -value = 0.011. It was concluded that the addition of SNAGS to conventional therapy was faster in reducing pain in the second week and disability in the third week in cases of grade I and II lumbar HNP.

Keywords: pain; disability; HNP lumbar grade I and II; conventional therapy; SNAGS

INTRODUCTION

Herniated Nucleus Pulposus is a rupture of the annulus fibrosus intervertebral disc which can compression the excitatory tissue of the lumbar that comes out of the intervertebral foramen, causing radicular pain, and ultimately causing lumbar disability⁽¹⁾. A herniated intervertebral disc produces a number of nociceptive neurotransmitter mediators and cytokines that provide nociceptive information from within the disc; high levels of inflammation have been found in disc tissue from patients with HNP. Production of proinflammatory mediators in the nucleus pulposus is considered a major factor in lumbar pain due to disc herniation⁽²⁾. The prevalence of HNP in Spain is around 19.9% for the age of 30-50, while in Indonesia it is estimated that around 40% of the population aged less than 65 years have suffered from low back pain where more men than women⁽³⁾.

Patients with HNP Grade I and II often have signs and symptoms such as: intermittent back pain (weeks to years). Pain can change from lying to sitting position, this pain comes from the waist to the posterolateral then to the lower leg. Coughing, sneezing, straining, standing, sitting for long periods of time and decreasing at rest or lying down are triggers for increased pain. The symptoms most often felt in patients with HNP are: tingling (paresthesia) or numbness and muscle strength decreases along its innervation distribution. Pain is provoked when around L5-S1 is palpation. Problems with HNP can come from several lumbar tissue structures such as: disc herniation, guarding spasm and muscle weakness, chronic inflammation of the joint capsule which can cause capsule contracture, and disruption of the facet joint⁽⁴⁾.

Physiotherapy has many kinds of manual therapy techniques and exercise therapy to overcome problems in the form of pain, muscle spasms, limited range of joint motion to the occurrence of disability in the lumbar spine caused by HNP. In this study, the physiotherapy modalities applied to overcome the problematic cases of HNP grade I and II were using conventional therapy and the addition of Spinal *sustained natural apophyseal glides* (SNAGS) to conventional therapy. Conventional therapy is a therapy that is generally used by physiotherapists in hospitals in the management of pain and disability in cases of grade I and II lumbar HNP. The therapy used is the provision of physiotherapy modalities in the form of Transcutaneous Electrical Nerve Stimulation (TENS) with the provision of exercise therapy in the form of McKenzie and back Strengthening Exercise technique training. Conventional therapy aims to reduce pain and target the prime mover muscles by providing relaxation, mobility, muscle strength and general conditioning effects⁽⁵⁾.

Mulligan introduced SNAGS to the lumbar in a therapy manual, this technique is a combination of physiological active movements and accessory passive movements. The hypothesis is explained that there is a relationship between facet joint hypomobility and disc disorders and why SNAGS can produce a direct effect on the facet joint⁽⁶⁾. During spine flexion, the disc is distorted and takes the form of a spur. The adjacent vertebral corpus will move ventrally and separate dorsally, while the nucleus will move posteriorly but the disc volume remains unchanged within the vertebral corpus area. For this movement, the facet joint must be mobile. If the facet joint is hypomobile then when trunk flexion occurs, the vertebral corpus that are close together will be able to move anteriorly but cannot separate dorsally.⁽⁷⁾ *Sustained Natural Apophyseal Glides* (SNAGS) *ekstension* is a mobilization technique with movement in the presence of passive glide from the spine along with active extension of the patient⁽⁸⁾. SNAGS extension is performed on the trunk extension in the prone lying position with anterior glides, the movement is smooth without any obstacles on the facet so that compression occurs in the posterior disc area which will facilitate the nucleus migration to the anterior, this will reduce radicular pain, reduce muscle spasm and increase flexion mobility in the lumbar⁽⁹⁾.

This study aims to prove that the addition of SNAGS to conventional therapy is faster in reducing lumbar pain and disability in cases of grade I and II lumbar HNP.

METHODS

This research was an experimental study using a control time series design. This research was conducted in RS. Dr. La Palaloi Maros, RS. Bhayangkara Makassar, and Inggit Medika Clinic Makassar. The population was HNP patients according to the criteria aged 35-50 years, male and female, physiotherapy examination results positive for pain on tests (laseque, spurling, springing and Valsalva maneuver), pain on flexion and reduced pain in extension, based on MRI results grade I and II lumbar HNP were found, has no history of surgery on the spine, and has no complications from other diseases such as spondylolisthesis, spondylosis and vertebral fractures. Obtained a population of 50 samples. Determination of the sample size using the Pocock formula with the results of 20 people per group according to inclusion criteria. Sampling using consecutive sampling technique, to divide the sample into two groups using a simple random sampling technique with the lottery method.

Data collected before intervention, after the first week until after the sixth week of conventional therapy intervention for the control group and addition of SNAGS to conventional therapy for the study group. The data used in this study were the actuality of pain and lumbar disability measured using the Visual analog scale (VAS) and the Oswestry disability index (ODI). Data were analyzed using Kruskal-Wallis, Wilcoxon test and post hoc independent Kruskal-Wallis tests. This research had been approved by the Health Research Ethics Commission of the Health Polytechnic of the Ministry of Health Makassar with Number 149/KEPK-PTKMS/IV/2022.

RESULTS

Based on the results of measuring the characteristics of the sample in this study, it can be seen in table 1. The results of the analysis of sample characteristics based on age showed that in the case control group the highest sample was aged 35-40 years as many as 10 samples or 50.00% and the lowest case sample aged 41-45 years as many as 4 samples or 20.00%, while in the study group the highest case sample was aged 35-40 years as many as 9 samples or 45.00% and the lowest case sample aged 41-45 years as many as 5 samples or 25.00%. Characteristics of the sample based on gender showed that the sample was more of men who had HNP than women. It can be

concluded that HNP cases are influenced by a person's productive age and work patterns and activities carried out by men who tend to do heavy physical activities involving the vertebral column.

Table 1. Characteristics of HNP patients by and gender

Variable	Control group		Study group	
	Frequency	Percentage	Frequency	Percentage
Gender				
Male	15	75.00	15	75.00
Female	5	25.00	5	25.00
Age				
35-40	10	50.00	9	45.00
41-45	4	20.00	5	25.00
46-50	6	30.00	6	30.00

Kruskall-Wallis test to determine the effectiveness after intervention and Wilcoxon test to determine the effectiveness every week in the control group and the study group to reduce lumbar pain and disability. The results of the Kruskal-Wallis test and the Wilcoxon test in the control group and the study group will be described in table 2 and table 3.

Table 2. The results of Kruskal-Wallis and Wilcoxon test of pain and disabilities in the control group

Measurement time	VAS (Wilcoxon)		ODI (Wilcoxon)	
	Mean±SD	p-value	Mean±SD	p-value
Pre test	5.84±1.17		40.60±9.21	
Post test 1	5.83±1.17	0.317	40.60±9.21	1.000
Post test 2	5.82±1.16	0.180	40.40±9.38	0.157
Post test 3	4.90±1.04	0.000	40.30±9.50	0.083
Post test 4	4.20±1.05	0.000	32.90±6.79	0.000
Post test 5	3.99±0.93	0.000	29.40±6.16	0.000
Post test 6	3.27±0.85	0.000	25.70±6.94	0.000
Kruskal-Wallis	4.93±1.40	0.000	36.27±10.28	0.000

The results of the Kruskal-Wallis analysis of mean pain and disability before and after the intervention in the control group showed a mean VAS value of 4.93±1.40 with p-value = 0.00 and the mean of ODI value was 36.27±10.28 with p-value = 0.00 (p<0.05) which means that there was an effect of conventional therapeutic intervention on changes in pain and disability. The results of the Wilcoxon analysis of mean pain and disability before the intervention and after the first week of intervention until after the sixth week of intervention. The results show the mean VAS before intervention was 5.84±1.17 and the mean VAS after the third week of intervention was 4.90±1.04 with p-value = 0.00. While the mean of ODI value before the intervention was 40.60±9.21 and the mean of ODI value after the fourth week of intervention was 32.90±6.79 with p-value = 0.00 (p<0.05). It could be concluded that the conventional therapy intervention produced a significant effect starting at the third week in pain changes and at the fourth week for changes in disability in cases of grade I and II lumbar HNP.

Table 3. The results of Kruskal-Wallis and Wilcoxon test of pain and disabilities in the study group

Measurement time	VAS (Wilcoxon)		ODI (Wilcoxon)	
	Mean±SD	p-value	Rerata±SD	p-value
Pre test	5.68±1.00		40.50±8.43	
Post test 1	5.68±1.00	1.000	40.40±8.33	0.320
Post test 2	4.57±0.79	0.000	40.20±8.63	0.118
Post test 3	4.06±0.78	0.000	28.60±6.23	0.000
Post test 4	3.38±0.65	0.000	24.25±5.62	0.000
Post test 5	2.63±0.67	0.000	19.30±6.47	0.000
Post test 6	1.94±0.63	0.000	15.80±5.80	0.000
Kruskal-Wallis	3.10±1.55	0.000	29.86±12.09	0.000

The results of the Kruskal-Wallis analysis of the mean of pain and disability before and after the intervention in the study group showed a mean VAS value of 3.10 ± 1.55 with $p\text{-value} = 0.00$ and the mean ODI value 29.86 ± 12.09 with $p\text{-value} = 0.00$ ($p < 0.05$) which means that there was an effect of the intervention of adding SNAGS to conventional therapy on changes in pain and disability. The results of the Wilcoxon analysis of mean pain and disability before the intervention and after the first week of intervention until after the sixth week of intervention. The results showed the mean VAS before the intervention was 5.68 ± 1.00 and the mean VAS after the second week of intervention was 4.57 ± 0.79 with $p\text{-value} = 0.00$ ($p < 0.05$), while the mean value of ODI before intervention was 40.50 ± 8.43 and the mean of ODI value after the third week of intervention was 28.60 ± 6.23 with $p\text{-value} = 0.00$ ($p < 0.05$). It could be concluded that the intervention of adding SNAGS to conventional therapy resulted in a significant effect starting at the second week in pain changes and at the third week for changes in disability in grade I and II lumbar HNP cases.

To find out that the addition of SNAGS to conventional therapy is faster than conventional therapy in reducing pain and disability in grade I and II lumbar HNP, Then the Kruskal-Wallis independent sample post hoc statistical analysis was used to compare the results of the first week post test to the sixth week of the mean pain and disability values in the two groups. The results of the Kruskal Wallis independent post hoc test in the control group and the study group will be described in table 4 and table 5.

Table 4. Kruskal Wallis independent post hoc test VAS values between the control group and the study group

VAS measurement	N	Control group			Study group			p-value
		Min	Max	Rerata±SD	Min	Max	Rerata±SD	
Pre test	20	4.1	7.5	5.84 ± 1.17	4.1	7.9	5.68 ± 1.00	0.551
Post test 1	20	4.1	7.5	5.83 ± 1.17	4.1	7.9	5.68 ± 1.00	0.322
Post test 2	20	4.1	7.5	5.82 ± 1.16	3.2	6.1	4.57 ± 0.79	0.014
Post test 3	20	3.6	7.4	4.90 ± 1.04	3.1	5.8	4.06 ± 0.78	0.001
Post test 4	20	3.1	6.6	4.20 ± 1.05	2.1	4.5	3.38 ± 0.65	0.000
Post test 5	20	2.4	5.6	3.99 ± 0.93	1.3	4.1	2.63 ± 0.67	0.000
Post test 6	20	2.1	5.1	3.27 ± 0.85	1.1	2.3	1.94 ± 0.63	0.000

The results of Kruskal Wallis' independent post hoc analysis were to find out in what week there were differences in the effectiveness of the change in pain values between the control group and the treatment group. In the second week post test the $p\text{-value} = 0.014$ ($p < 0.05$) which means that there was a difference in time effectiveness in the control group and the study group on pain reduction in grade I and II lumbar HNP. Based on the mean value and standard deviation of the second week of pretest and posttest in the control group and the study group, it could be concluded that the study group (addition of SNAGS to conventional therapy) is faster to reducing pain in grade I and II lumbar HNP than the control group (conventional therapy) starting at the second week.

Table 5. Kruskal Wallis independent post hoc test ODI scores between the control group and the study group

ODI measurement	N	Control group			Study group			p-value
		Min	Max	Rerata±SD	Min	Max	Rerata±SD	
Pre test	20	26	60	40.60 ± 9.21	28	60	40.50 ± 8.43	0.871
Post test 1	20	26	56	40.60 ± 9.21	26	52	40.40 ± 8.33	0.559
Post test 2	20	26	54	40.40 ± 9.38	20	52	40.20 ± 8.63	0.174
Post test 3	20	26	50	40.30 ± 9.50	16	40	28.60 ± 6.23	0.011
Post test 4	20	20	46	32.90 ± 6.79	8	34	24.25 ± 5.62	0.000
Post test 5	20	20	42	29.40 ± 6.16	4	28	19.30 ± 6.47	0.000
Post test 6	20	16	42	25.70 ± 6.94	4	24	15.80 ± 5.80	0.000

The results of Kruskal Wallis' independent post hoc analysis were to find out in what week there were differences in the effectiveness of the change in disability values between the control group and the study group. In the third week post test the value of $p = 0.011$ ($p < 0.05$) which means that there is a difference in time effectiveness in the control group and the treatment group to decrease disability in grade I and II lumbar HNP. Based on the mean value and standard deviation of the third week pretest and posttest in the control group and the study group it can be concluded that the treatment group (addition of SNAGS to conventional therapy) is faster to reducing disability in grade I and II lumbar HNP than the control group (conventional therapy) starting in the third week.

DISCUSSION

Based on the characteristics of the sample, the value of the degree of pain and disability using measuring instruments in the form of VAS and ODI in 40 samples in this study obtained several findings. Based on the results of the analysis of the characteristics of the sample, it shows that the incidence of HNP is strongly influenced by the productive age of a person who is increasingly active in activities. Age is one of the internal factors that cause HNP where at productive age the intervertebral disc will experience a gradual demineralization process at the end of the cartilage which is the weak point of the disc or the site of failure when the pressure load becomes excessive⁽¹⁰⁾. In addition to the age factor, HNP is also influenced by gender where there are more males than females. This can happen because the work activities of men with various types of work and frequency are more and greater so that, it is very possible for abnormal position errors or the wrong way of lifting which are factors that cause HNP⁽¹¹⁾.

The addition of SNAGS to conventional therapy was faster to reducing pain and disability in cases of grade I and II lumbar HNP. This is statistically proven that there is a decrease in pain in the second week and improvement in disability occurs in the third week after the addition of SNAGS to conventional therapy in the treatment group. This can occur because by correcting a "minor positional fault" in the vertebral movement segment through a combination of accessory movements accompanied by physiological movements of lumbar extension. SNAGS extension can result in improved facet joint mobility and move the nucleus pulposus centrally.^{(6)(12),(13)}

Mulligan described in his hypothesis the relationship between the facet joint and the intervertebral disc. If the facet joint is hypomobile when flexion occurs, the disc protrudes posteriorly and causes pain. Then if there is weakness in the posterior wall of the disc, the problem will be even greater in terms of the hypomobile facet joint. It has also been showed that during lumbar flexion, there is movement in the facet joint and an increase in the gap in the opposite facet joint so that SNAGS clearly plays a role in overcoming the hypomobility of the facet joint and help Mc.Kenzie response in relieving pain caused by grade I and II lumbar HNP. *Sustained natural apophyseal glides* (SNAGS) is one part of the Mulligan Concept by providing mobilization of the spinous process. The addition of SNAGS can improve facet joint mobility and reposition the nucleus pulposus towards the center. The existence of physiological extension motion accompanied by accessory movement of the facet joint towards the cranial in this technique can reposition the nucleus pulposus back towards the center and correct the positional fault of the facet joint surface. This situation can minimize disc pressure on excitatory tissue and freedom of movement so that pain can be reduced because SNAGS can produce an immediate effect in reducing pain and increasing improvements in Functional Disability in cases of grade I and II lumbar HNP⁽⁷⁾⁽⁸⁾⁽¹⁴⁾.

The conventional therapy is a combination of three physiotherapy modalities, namely TENS, Mc.Kenzie exercise and back strengthening. Giving TENS that stimulates sensory nerves in treating pain caused by lumbar HNP through the mechanism of "gate control theory" with the concept of an analgesic response, namely stimulation of A-beta sensory fibers that close the spinal cord gate which can block pain impulses carried by A-delta and C sensory fibers, excitatory tissue of the dorsal part of the vertebral column caused by pressure on the disc or facet⁽¹⁵⁾⁽¹⁶⁾. Back strengthening increases muscle strength and endurance so it can increasing the stability of the spine and can prevent the recurrence of micro-injury and reduce the symptoms of low back pain due to HNP⁽⁵⁾. While Mc. Kenzie is a form of exercise that emphasizes active movement that is lumbar extension. In conditions of lumbar HNP this exercise is done repeatedly and continuously to minimize disc irritation to excitatory sensitive tissue. Based on the biomechanical aspect, the lumbar extension movement will cause the nucleus pulposus to be pushed ventrally followed by suppression of the annulus fibrosus on the dorsal side while on the ventral side there is stretching. This biomechanical aspect is the basis for choosing a lumbar extension exercise program from Mc.Kenzie exercise which can push the herniated nucleus pulposus towards the posterior so that the irritation of the nerve roots is reduced and can even disappear and gradually reduce pain and decrease disability.⁽¹⁷⁾⁽¹⁸⁾.

CONCLUSION

Based on the results of data analysis that has been obtained, it can be concluded that the addition of SNAGS to conventional therapy is effective faster in the second week in reducing pain and effective faster in the third week in the improvement of disability in cases of grade I and II lumbar HNP.

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