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Original Research Article

COMPARISON OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) AND DRY NEEDLING (DN) TREATMENT ON CHORNIC LOW BACK PAIN PARTICIPANTS: A RANDOMIZED CONTROLLED STUDY

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ABSTRACT

Background: Low back pain (LBP) is most commonly affects the individuals with a lifetime prevalence of 60–70%. Chronic low back pain (CLBP) is a multidimensional problem. There are various treatment approaches available to CLBP. Myofacial trigger point was commonly found in chronic pain syndrome. Recently, Dry Needling has the more significant emphasis even though other various treatments are available.

Objective: To compare the effectiveness of Transcutaneous electrical nerve stimulation and Dry needling treatment on pain, lumbar ROM and functional disability in chronic low back pain participants.

Materials and Methods: A total 30 chronic low back pain individuals were randomly assigned into three groups conventional physiotherapy (Control Group),TENS (Experimental Group-1);and; Dry needling(Experimental group-2); n=10 in each group. All patients were treated for 3weeks and improvement was assessed in pain (NPRS) , lumbar range of motion (m.ST) and lumbar functional(m.ODI)used at prior interventions and after 3weeks.

Result: In this study result showed that TENS group and dry needling(DN) treatment group were effective in all the measures when compared to control group. DN was more effective in improving lumbar ROM, lumbar functional and reduction of pain when compared to TENS.

Conclusion: The result of the study indicates that DN treatment was found to be superior to TENS in improving lumbar ROM and functional and reduction of pain among chronic low back pain participants.

KEYWORDS: CLBP, myofascial Trigger point, TENS & DN.

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INTRODUCTION

Low back pain is a major health problem, People with acute low back pain usually experience improvements in pain, disability, and return to work within 1 month, further a large variety of therapeutic interventions are available to treat it. Almost 90% of all patients with acute LBP recover quite rapidly, regardless of therapy. The remaining 10% are at risk of developing chronic pain and disability and account for more than 90% of the social costs for back incapacity [1].

As a consequence of the almost universal

presence of osteoarthrosis of the intervertebral joints and osteoporosis with collapse of the vertebral bodies, the muscles in the lumbar region and hip girdle are likely to have suffered stresses over a long period [2].

CLBP is a multidimensional health problem including pain, functional disability, socioeconomic and psychosocial dimensions. The overloading of spinal structures leads to micro-injuries, inflammation, pain, functional disability and neuromuscular dysfunction.

In chronic low back pain there is a chance to develop secondary MTrPs due to abnormal posture, sustained overload, derangement and dysfunction of spine or imbalance of global and local core muscles in long duration back pain sufferers [3].

In the lower half of the body, the quadratus lumborum syndrome is a common cause of low back pain, and the piriformis syndrome a common cause of buttock, hip, and lower extremity pain. Primary MPS can also be secondary pain syndromes [4].

Dr. laura perry reported that the quadratus lumborum (QL) trigger points also play a prominent role in chronic low back pain patients as well, becoming a key factor in the subsequent onset of sciatica symptoms and hip pain complications [5].

The myofascial trigger or tender point is a localised hyper-irritable taut band in a skeletal muscle fibres. Important characteristics of a myofascial trigger point include tenderness, referred pain or referred tenderness and a local twitch response. although the etiology of MTrPs is completely unknown, few recent studies have reported that the due to injury or overloaded muscle fibers [6].

Dry needling(DN) or intramuscular manual therapy is a neuromuscular manual therapy is a neurophysiological evidence based treatment technique used to treat myofascial pain that uses a dry needle, without medication. when inserted into a contracture knot, the goal is to release or inactivate the trigger points and relieve the pain [7].

Trigger point dry-needling or intramuscular manual therapy involves the insertion of a sterile acupuncture needle or any other injection needle without injecting any liquid medicine at the trigger points. The needles will be inserted superficial or deep for few seconds at the trigger point and then they are removed once the trigger point is inactivated [8].

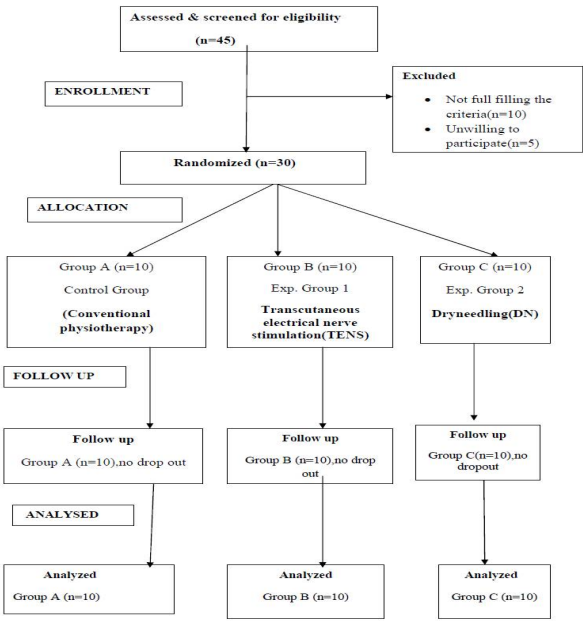
Transcutaneous electrical nerve stimulation (TENS) has been increasingly used in physical therapy for the relief of acute and chronic pain.

Chronic low back pain is a common problem within our society affecting individual's physical and social functioning considerably and interfering with sufferer's daily activities. It is not known if the benefits of dry needling exceed those of TENS, as none of the studies included such a comparison.

Therefore, the aim of the current study was to compare the effects TENS and dry needling(DN) treatment on pain, lumbar range of motion and functional disability in chronic low back pain study participants.

Hypothesis of this study was there is a statistical significant difference in comparative effects of TENS &dry needling treatment on pain, lumbar range of motion and functional disability in chronic low back study participants in local population of Surendranagar.

Fig. 1: Consort Format (Randomization).



MATERIALS AND METHODS

Patients: Patients age between 35 to 60 years with a history of LBP were recruited from the C.U.Shah Medical Hospital and C.U.Shah

physiotherapy musculoskeletal and sports physiotherapy department, surendranagar for the study. Institutional ethical approval were obtained for this study, and all participants gave informed consent. 30 patients were enrolled who reported LBP morethan 6 months (**Table-1).**

Table 1: Demographical details.

Variables	Control Group (n=10)	TENS€ Group (n=10)	DN© Group (n=10)	p-value
	Mean ±SD	Mean ±SD	Mean ±SD	p > 0.05
Age (Y)#	48.30 ± 6.09	44.40 ± 6.58	51.73 ± 5.10	0.266
Body height(cm)	161.2 ± 10.23	157.4 ± 10.02	156.8± 9.70	0.572
Body mass(kg)	62.80± 5.28	62.80± 5.15	67.30 ± 3.91	0.073
BMI(Kg/m^2)*	24.37± 3.22	25.36 ± 1.78	27.41 ± 2.31	0.035
Duration (month)	09.50± 3.43	13.30± 9.90	8.70± 4.24	0.26
Gender	Male = 50.00% Female = 50.00%	Male =30.00% Female=70.0%	Male = 20.00% Female = 80.00%	
*BMI=Body mass index,DN©=dry needling & Y#=years. TENS€=Transcutaneous electrical nerve stimulation				

Inclusion criteria: 1. Both male and female participants 2. patients with history of myofascial pain syndrome in the low back region 3. lumbar or lumbosacral LBP for a duration of six months or longer 4. unilateral trigger point over the quadtratus lumborum 5. no radiating of LBP 6. normal neurological examination findings of lumbosacral nerve function, including deep tendon reflexes, plantar response, voluntary muscle action, straight leg raising, and sensory function, and 7**.** no previous treatment with acupuncture dry needling [9-11].

Exclusion criteria: 1. Subjects with history of rheumatologic disorders and spine infections 2. any genetic bleeding disorder and blood disorder 3. Individuals who already participated in any physiotherapy or fitness training program for low back pain 4. Subjects with malignancy 5. Ankylosing spondylitis 6. severe osteophorosis 7. Psychiatric disease 8. Previous adverse reaction to acupuncture or anesthetic 9. Pregnancy& women with postnatal back pain 10. Severe overweight (body mass index, BMI > 32) 11. Subjects with central nervous system impairments 12. Any respiratory or cardiovascular impairment and peripheral vascular disease. 13. Recent significant trauma of spine 14. Recent lumbo &lumbosacral Spinal surgery 15.Chronic corticosteroid use 16. Immuno deficiency patients 17.Needle phobia and 18.Muscle trigger point injection in prior 6 months19.Patient unwilling to participate [9-11].

Design: This study design was Randomised, controlled study. A total 30 low back pain study participants who fulfilled selection criteria were recruited to this study. Here was simple random sampling method[computer generated randomization]. The total 30 participants were randomly assigned in to three groups. Group A(n=10)received conventional physiotherapy, Group B(n=10)received TENS& Group C(n=10) Dry needling. the treatment codes were given to a single physiotherapist administered all the therapies. The patient were kept blind to treatment assignment. Each patient received a each session of 30 minute treatments, three times per week for total 3weeks.The primary outcome measures of NPRS, modified schober test and modified oswestry disability questionnaire were assessed on all subjects before and after receiving either the experimental and control interventions.

Primary Outcome measures: The baseline pre-intervention primary outcome measures consisted of pain assessment using Numerical pain rating scale(NPRS),lumbar range of motion was assessed by using modified schober test (m.ST) and lumbar functional disability was assessed by using modified- oswestry disability questionnaire (m.ODI).

NPRS is a self assessing questionnaire (quality outcome). It was used to measure the patients current level of pain intensity. It is an ordinal scale using a 10cm horizontal line with “no pain” anchored at left end and “pain as bad as it could be “anchored at right. The patient was asked to place a mark on the line that represented the severity of his or her pain at the moment [12].

The second outcome measure was the modified schober test (m.ST). It is the test used to assess the lumbar range of motion. In this study the patient was in standing with back towards the examiner. The therapist was determined the location of the dimple and Venus. The intersection of the top dimples of venus was marked by drawing a horizontal line. that line was the land mark. the 2nd line was marked above 10 cm above the 1st and the 3rd was marked the 5cm below the first line. The difference between the measurements in erect standing and flexed positions was indicated the outcome of the lumbar flexion [13].

The third outcome measure in this study was Modified ODI. It is a self report questionnaire. In this study questionnaire was used to assess, how the back pain patients was affected their daily functional or activities in daily living. It consists of 10 items and each items has the score of 0-5 with 0 representing no limitation and 5 representing maximal limitation [14].

Interventions procedure for Group A (control group): Group A study participants were received Conventional physiotherapy such as trigger point therapy such as cold spray and stretch technique over the trigger point of quadratus lumborum muscles. All the study participants undergone conventional supervised exercises . The supervised exercise program was simple classical back exercise such as isometric abdominal exercise(10x3repetitions), SLR (10x3repetitions), hamstring stretch (3 repetitionsXeach stretch to be 30seconds hold) and Back extensors Exercise (10x3 repe-titions). The treatment was given thrice in a week for 3 weeks [6,15]. **[Fig 2 & 3]**

TENS treatment procedure (Group B): Group B patients were received the TENS (Biotec medical suppliers) treatment. Here low frequency TENS was used for the treatment. The frequency range output was 4-8HZ, 4 X 4 square size, rubber electrode,2-channels used. Four electrodes was placed securely at the center to the painful area of the back and the current intensity was gradually raised according to patient tolerance. 30 minutes duration the TENS was applied. Then all the participants additionally taken conventional physiotherapy. This all intervention was given thrice in a week for 3 weeks [10,11]. **[Figure-4]**

Dry needling treatment procedure (Group C): Group C Patients received a course of SDN to affected TrP (quadratus lumborum) followed by appropriate stretching exercises to be continued. Exercises used were those recommended by Simons et al. TrPs implicated in the condition was palpated and marked with a small dot on the skin at each treatment session, then needled was inserted perpendicular, usually working from proximal to distal. Sterile acupuncture needles (0.25 x 40mm) with plastic guide tubes were used (made by suzhou tianxie acupuncture instruments co.,Ltd). The needle was inserted to the depth allowed by the guide tube.

DN was performed to the quadratus lumborum muscle at the areas determined by deep palpation as a possible locations of the MTrPs. For treatment position was side lying with pillow under the waist. QL muscle Palpation land marks;12th rib (or) iliocrest(or) lateral borders of L1-L4. The needles used for the treatment of the patients was solid monofilament sterile acupuncture needle(0.25 diameter X 40 mm) in length. After cleaning the treatment area the needle was inserted through the muscle belly in the tender nodule in the taught band. Each needle was held in the therapist's dominant hand for application of and manipulation of the needle within the tissue. The DN technique utilized three fast-in/out movements within the tender nodule in the taut band of muscle(QL). the needle discarded into a sharps container and other precaution was taken as per the guidelines of dry needling academy manual [16-17]. At end of DN all the participants underwent active stretching of QL. **(Figure 5 & 6**) Then all patients were instructed to undergo conventional physiotherapy. This all intervention was given thrice in a week for 3 weeks.

Statistical analysis: All statistical analysis was done using SPSS 16.00 for windows software. Descriptive analysis was used to calculate mean and standard deviation (SD). Inter group comparison of pre and post was done with one way ANOVA &for intra group comparison pre and post was done with paired'-test & Wilcoxon Signed Rank test was used**.** Further, bonferroni post hoc analysis was performed for multiple intergroup comparisons. Confidence interval was set at 95%,p=0.05 for all the analysis.

Fig. 2: isometric back exercises**.**

Fig. 3: Straight leg raise.

Fig. 4: TENS treatment.

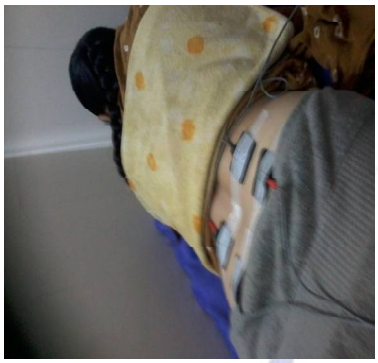


Fig. 5: Dryneedling treatment for QL.

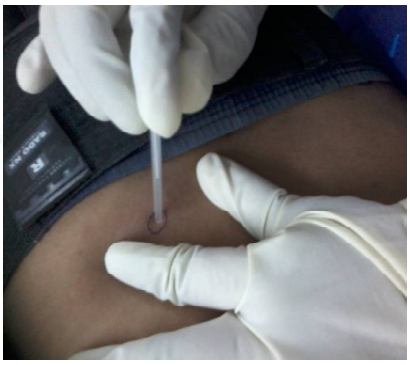


Fig 6: Quadratus lumborum stretching exercise.

Fig. 7: Pre treatment group comparison (A,B &C).

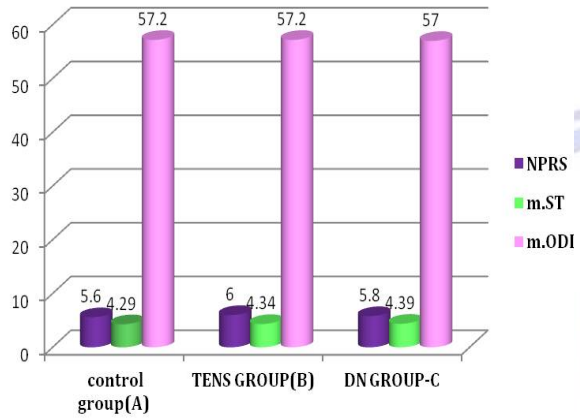
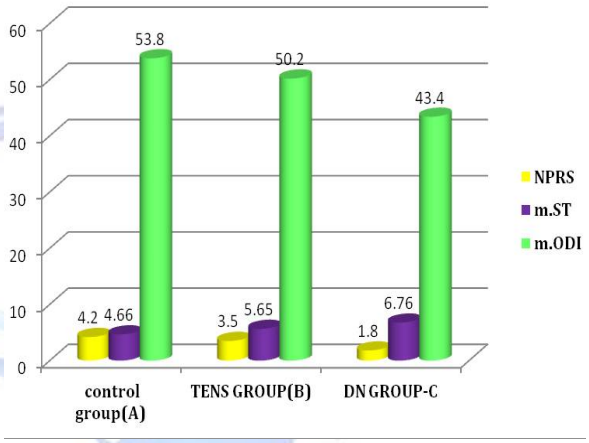


Fig. 8: Post treatment group comparison (A,B &C).



RESULTS

Table 2: Inter & Intra Group Comparison of PAIN INTENSITY- NPRS [A,B & C].

Group	Pre Test Value				Post Test Value				p Value (Intra)
	MEAN	±SD	MIN.	MAX.	MEAN	±SD	MIN.	MAX.	
Control (A)	5.6	±0.97	4	7	4.2	±1.03	3	6	0.006
TENS (B)	6	±0.81	5	7	3.5	±1.17	1	5	0.004
DN (C)	5.8	±0.79	5	7	1.8	±0.92	0	3	0.004
p Value (Inter)	0.865				0				

Table 3: Inter & Intra Group Comparison (A, B &C) of lumbar ROM.

Group	Pre Test Value				Post Test Value				p Value (Ina)
	MEAN	±SD	MIN.	MAX.	MEAN	±SD	MIN.	MAX.	
Control (A)	4.29	±0.92	3.1	6.1	4.66	±0.86	3.4	6.3	0.001
TENS (B)	4.34	±0.92	3	6	5.65	±0.72	4.7	7	0.001
DN (C)	4.39	±1.09	3	6	6.76	±1.23	4	8	0
p Value (Inter)	0.974				0				

Table 4: Inter & Intra Group Comparison of modi.ODI (A, B &C).

Group	Pre Test Value				Post Test Value				p Value (Intra)
	MEAN	±SD	MIN.	MAX.	MEAN	±SD	MIN.	MAX.	
Control (A)	57.2	±1.93	54	60	53.8	±2.39	50	58	0.007
TENS (B)	57.2	±2.14	54	60	50.2	±2.89	46	56	0.005
DN (C)	57	±2.16	54	60	43.4	±3.27	38	48	0.005
p Value (Inter)	0.97				0				

Table 5: Multiple Comparison of the mean difference of PAIN INTENSITY- NPRS between Group A, B and C.

Dependent Variables	Groups		Mean difference	Std. Error	Sig.	95%Confidence Interval	
						Upper Bound	Lower Bound
Post NPRS	A	B	0.7	0.469	0.442	-0.04972	1.8972
		C	2.40*		0	1.2028	3.5972
	B	A	-0.7		0.442	-1.8972	0.4972
		C	1.70*		0.004	0.5028	2.8972
	C	A	-2.40*		0	-3.5972	-1.2028
		B	-1.70*		0.004	-2.8972	-0.5028
*. The mean difference is significant at the 0.05 level.							

Table 6: Multiple Comparison of the mean difference of lumbar ROM between group A, B and C.

Dependent Variables	Groups		Mean difference	Std.Error	Sig.	95%Confidence Interval	
						Upper Bound	Lower Bound
Post lumbar ROM	A	B	-0.99	0.431	0.089	-2.0896	0.1096
		C	-2.10*		0	-3.1996	-1.0004
	B	A	0.99		0.089	-0.1096	2.0896
		C	-1.11*		0.047	-2.2096	-0.0104
	C	A	2.10*		0	1.0004	3.1996
		B	1.11*		0.047	0.0104	2.2096
*. The mean difference is significant at the 0.05 level.							

Table 7: Multiple Comparison of the mean difference of modi.ODI between group A, B and C.

Dependent Variables	Groups		Mean difference	Std.Error	Sig.	95% Confidence Interval	
						Upper Bound	Lower Bound
Post m. ODI	A	B	3.60*	1.098	0.009	0.797	6.403
		C	8.00*		0	5.197	10.803
	B	A	-3.60*		0.009	-6.403	-0.797
		C	4.40*		0.001	1.597	7.203
	C	A	-8.00*		0	-10.803	-5.197
		B	-4.40*		0.001	-7.203	-1.597
*. The mean difference is significant at the 0.05 level.							

3weeks of TENS versus DN interventions led to the findings that DN treatments group improved significantly in lumbar flexion m.schober test), lumbar function and reduction in pain (NPRS),when compared to alone conventional physiotherapy group(A-control group). After analysis of pre and post treatment scores, it results interpreted that significant improvement ($p<0.05$) in DN group. There was significant difference ($p<0.05$) in post treatment comparison between with TENS, DN and control group(Table-II,III &IV). The findings of this study suggested that DN along with conventional physiotherapy training is effective in the treatment of chronic low back pain. The DN shows more effectiveness than that of TENS & control group in NPRS, m.schober test & modified ODI score.

The present study also showed that DN group had a more significant functional improvement (a decrease in pain from 5.8 to 1.8 points compared to 6.0 to 3.5 points for the TENS group and 5.6 to 4.2 points in control group) and improvement in lumbar range of motion[m. schober test] (from 4.39 to 6.76 and compared to 4.34 to 5.65 for the TENS group, and compared with 4.29 to 4.66 control group) and decrease in modified ODI (from 57.00 to 43.40 points compared to 57.20 to 50.20 points in the TENS group and compared with 57.20 to 53.80 in control group[CG].[Table- 2,3,4]

The Table 5 shows the comparison of mean of difference of post intervention NPRS between Groups A, B & C. This comparison is done through post-Hoc analysis Bonferroni test. it

difference between group B & Group C with the p value of 0.004((i.e<0.05).however it can be observed that largest significant change is in Group C as compared to Group A &Group B.

The Table 6 shows the comparison of mean of difference of post intervention modi.ST between Groups A, B & C. This comparison is done through post-Hoc analysis Bonferroni test. it shows that there is no significant difference between Group A & B with p value of 0.089(i.e>0.05),Group A& Group C with p value of 0.000((i.e<0.05),and also there is significant difference between group B & Group C with the p value of 0.047((i.e<0.05).however it can be observed that largest significant change is in Group C as compared to Group A &Group B.

The Table 7 shows the comparison of mean of difference of post intervention modi.ODI between Groups A, B & C. This comparison is done through post-Hoc analysis Bonferroni test. it shows that there is significant difference between Group A & B with p value of 0.009(i.e<0.05),Group A& Group C with p value of 0.000((i.e<0.05),and also there is significant difference between group B &Group C with the p value of 0.001((i.e<0.05).however it can be observed that largest significant change is in Group C as compared to Group A &Group B.

DISCUSSION

This current study results indicate that there is significant improvement in lumbar ROM and lumbar function and reduction of pain in patients with chronic low back pain in patients at end of 3weeks in all the three groups after conventional physiotherapy alone(group A),TENS with CPT(group B) and DN with CPT(group C). All the three treatment groups obtained successful outcomes as measured by significant improvements in lumbar ROM and lumbar functional and reduction of pain after 3 weeks of treatment program.

Chronic low back pain is one of the conditions which can be treated by a wide variety of physiotherapy methods. It is still difficult to formulate all proof guidelines for the management of chronic low back pain. In chronic low back pain there is a chance of secondary MTrPs has develop due long term pain, imbalance of global and local core muscles. Various trigger point therapy and other interventions are exists with own claims of success without any attempts of comparing the maximal effective methods.

In our study, we found that TENS and DN along with conventional physiotherapy (both) were effective in reducing pain, disability and improving lumbar ROM in chronic LBP patients.

Andrea D et al (2005) updated review of all available scientific evidence, including evidence from Chinese and Japanese trials, on the effects of acupuncture for LBP, and dry-needling for MTrPs in the low back region [18].

It is still the exact working mechanisms of acupuncture or dry needling is unknown. But with few evidence, superficial dry needling is a relatively quick and pain free method of MTrPs deactivation. It is thought to work by descending pain inhibition mechanism of gate control theory and local muscle fibers relaxation. Acupuncture/ dry needling may trigger the production of pain inhibition substance such as endorphins, serotonin within the CNS, enhancing analgesia [8,9,16,17].

In our study effect is similar to previous authors research report [8,9,16,17,19,20] so, these interventions can be applied in clinical set up for better healthy life.

Limitation: 1. Small sample size 2. Intermediate and long term follow up was not taken.

Further scope of study: Dry needling as an isolated intervention in the management of chronic LBP is limited and inconsistent. So further study is needed with large samples and more RCT.

CONCLUSION

Our study concludes that after 3weeks treatment of Transcutaneous electrical nerve stimulation and dry needling treatment were effective in chronic low back pain patients. But dry needling treatment was superior than the transcutaneous electrical nerve stimulation.

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Conflicts of interest: **None**

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