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COMPARATIVE STUDY OF IONTOPHORESIS BY DEXAMETHASONE AND TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION IN THE TREATMENT OF PAINFUL HEMIPLEGIC SHOULDER

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ABSTRACT
To study the short & long term effect of iontophoresis by dexamethasone & transcutaneous electrical nerve stimulation for the relief of pain & improvement of functional capacity in patients with painful hemiplegic shoulder. In this double blinded, randomised, trial of 63 (2 patients discontinued the study) patients with painful hemiplegic shoulder were recruited from rehabilitation unit. They were randomly divided into two groups. One of the group received maximum twelve treatments of iontophoresis to the site of maximum tenderness on the anterior & lateral aspect of shoulder joint. Other group received transcutaneous electrical nerve stimulation (TENS) to the region of shoulder joint. Stiffness and pain were recorded at the initial session; follow up at two, four & eight weeks. Data from 59 subjects were used in the study. After the treatment phase, all groups showed significant improvements in average pain, and functional ability. However, iontophoresis group showed a significantly greater improvement than the TENS intervention ($p = 0.031$). At the follow up, similar improvement was noted. Twelve treatments of dexamethasone iontophoresis combined with taping gave greater relief from morning pain than TENS group. For the best clinical results at four weeks, taping combined with dexamethasone is the preferred treatment option compared with taping & TENS.
Keywords: iontophoresis, painful hemiplegic shoulder, TENS, Pain relief, functional improvement

INTRODUCTION

Hemiplegic shoulder pain has been shown to affect stroke outcome in a negative way [1]. Shoulder pain resulting from hemiplegia is a common clinical consequence of a focal cerebral insult resulting from a vascular lesion (ie. hemorrhagic or ischemic stroke). The incidence of shoulder pain varies between studies, with estimates which range from 48% to 84%[2,3] from 16% to 72%[4,5], It interferes with recovery after a stroke: it can cause considerable distress and reduced activity and can markedly hinder rehabilitation.[6,7,8] The period of hospitalization may be prolonged in hemiplegic patients with shoulder pain.[1]It is an annoying complication that may be refractory to treatment and cause poor recovery.[9] .Therefore the goals of treatment are pain reduction and improvement of range of motion. As pain decreases, an exercise programme may be performed to improve range of motion.[3] Thus it is very important in rehabilitation clinics to deal with this problem as early as possible. The cause of HSP is a subject of extensive debate and is probably ltifactorial.[10] Shoulder pain can hinder rehabilitation and functional recuperation, owing to its debilitating effects, which may mask any improvement in motor function.[11] In spite of intense efforts to prevent shoulder pain, clinical experience shows that the total eradication of this complication still remains enigmatic and the optimal management for the pain is uncertain.[12, 13] Iontophoresis (a.k.a. Electromotive Drug Administration (EMDA) is a technique using a small electric charge to deliver a medicine or other chemical through the skin.[14] Ionotpohoresis has been commonly used for the relief of pain in conditions such as inflammation. One of the possible causes of pain in patients with stroke is bursitis which often goes unnoticed. Thus the aim of our study was to compare the effects of TENS & iontophoresis in the treatment of painful hemiplegic shoulder for the relief of pain & improving functional ability.

Methods

The patients with hemiplegic shoulder pain were included in this study. Subjects were recruited over a 12-month period and all were hospitalized in our Rehabilitation Unit. Ethical committee approval was obtained prior to beginning the study. The inclusion criterion was post-stroke hemiplegic shoulder pain which did not spread to the distal limb. Those who had neglect, neuropathic pain, pressure sores or any infection (urinary, respiratory, etc.) or language difficulties were excluded. A standard anteroposterior radiograph of the glenohumeral joint was made and signs of degenerative changes at the glenohumeral joint were also accepted as an exclusion criterion. Subjects were assessed within first week of admission to the clinic. Patient demographics, including age, gender, details of aetiology, time since stroke, affected side were recorded. All measurements were done by a physiotherapist before and after the procedure. The subjects were allocated with a coin-tossing method by an investigator who was blinded about the examinations and measurements
During the treatment phase, patients received maximum twelve treatments of iontophoresis to the site of maximum tenderness on the anterior & lateral aspect of shoulder joint. Patients in group A received 0.4% dexamethasone, Current was applied up to 4 mA, and a total dose of 40 mA.min was delivered over a period of time determined by the patient's sensitivity[15]. Group B received TENS The application mode was low intensity TENS i.e., a frequency of 100Hz, a phase duration of 60µs and 30 minutes treatment time. [16]
The twelve treatments were delivered on alternating days over a period of two weeks. At each treatment session, the LowDye taping was renewed, so that all subjects were continuously taped for four weeks. Before all iontophoretic treatments, the shoulder area was wiped with acetic acid (household vinegar) to mask the smell of the different solutions and minimise the chance of the patient and treating doctor being unblinded to the group allocation.

Measurements of primary outcomes were repeated at two week intervals (baseline, after treatment, and at follow up).

Outcome measures

Functional improvement & pain relief was recorded with the help of SPADI-Shoulder Pain And disability Index. The Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper-extremity use. It shows good internal consistency, test-retest reliability, and criterion and constructs validity. It can detect change over time and accurately discriminates between patients who have improved or worsened.[17]

Statistical analysis

Total 63 patients were enrolled in the study; however 4 patients were lost during the follow up.

Table :1

	Treatment group		Between groups differences (P- value)
	TENS group N=24	Iontophoresis group N=25	
Age Mean _+SD	56.6 ± 6.6	60.0 ± 8.20	0.239*
Gender			
Male n (%)	11(45.83)	12(48)	
Female n (%)	13(54.17)	13(52)	
			0.409*
Type of stroke			
Haemorrhagic n (%)	13(54.17)	16(64)	
Ischaemic n (%)	10(41.67)	09(36)	
Unobtainable n (%)	01(4.17)	00	
			0.748
Duration of pain			
Less than 2 weeks n (%)	09(37.58)	10(40)	
2 weeks – 2 month n (%)	08(33.33)	07(28)	
2month – 4 months n (%)	07(29.17)	08(32)	
			0.528*
Side of hemiplegia			
Right n (%)	10(40)	09(36)	
Left n (%)	14(58.33)	16((64)	
			0.590*

SD=standard Deviation , N=number of subjects in one group, n= number of subjects in subgroup, * =Non-significant

Table 2. Changes in Mean Scores on the SPADI

	Treatment group		Between groups Differences (P- value)
	TENS Group N=24	Iontophoresis group N=25	
S0	70.17+8.34	70.1+7.1	
S2	61.95+7.8	55.73+7.55	
Difference S2-S0			6.96 SP<0.05
S4	51.14+8.32	39.94+6.83	
Difference S4-S0			8.2 SP<0.05
S6	41.18+9.47	24.48+6.73	
Difference S6-S0			9.66 SP<0.05

S0- Baseline Score of SPADI, S2 -score of SPADI after 2weeks, S4- score of SPADI after 4weeks , S6- score of SPADI after 6weeks

DISCUSSION

Results of the study indicates that iontophoresis group showed better improvement in the functional capacity as measured with the help of SPADI, at 2nd, 4th & 6th week of the intervention period. Bursitis is one of the causes of Painful hemiplegic shoulder which goes unnoticed & hence untreated. Friction between tendons rotator cuff muscles & anatomical neck many a times exacerbates the symptoms.

Iontophoresis has shown to be effective in the reduction of pain particularly so in the acute condition. The mechanism of pain relief as reported in literature applies here too.

The medication introduced to the body through iontophoresis bypasses the gastrointestinal tract. This is important for several reasons. First, medication-sensitive areas typically aren't irritated and a patient experiences fewer symptoms of ulceration. Second, iontophoresis delivers medication to a specific injury site. And third, this modality reduces the incidence of constipation, a problem among patients who use pain medications and anti-inflammatories[15]. Pain relief immediately brings improvement in functional acitivities as measured here with the help of SPADI.

The benefits of taping found in this study are consistent with research in which mechanical adaptations—that is, taping,

orthoses—are prescribed.[18,19] In the clinical setting, LowDye taping results in almost immediate changes in symptoms. It is proposed that, during this short term alleviation of symptoms, the adjunct management options have time to reach therapeutic thresholds.

Continuous taping, however, is difficult as patients become sensitive to the tape. This may lead to skin breakdown. In this study, the four weeks of taping resulted in about 34% of cases in which there were clinically noticeable changes to the skin by the end of the two weeks. This suggests that longer term use of taping may be problematic and any adjunct intervention that prolongs the treatment effect would be of great benefit.

TENS has always been a modality of choice for the treatment of painful hemiplegic shoulder. It mainly works on the principle of blocking the pain pathway but works very little actually at the site of injury.

CONCLUSION

Twelve treatments of dexamethasone iontophoresis combined with taping gave greater relief from morning pain than TENS group. For the best clinical results at four weeks, taping combined with dexamethasone is the preferred treatment option compared with taping & TENS.

What is already known on this topic

There are various studies which have studied the effects of TENS on painful hemiplegic shoulder.

What this study adds.

This is the first of its type of study which has studied the effect of ionotophoresis in patients with painful hemiplegic shoulder. Hence this study adds another modality in the list of treatment options available for painful hemiplegic shoulder.

This study found that a protocol of twelve treatments of Dexamethasone iontophoresis combined with taping provides greatest relief of the pain & functional ability in patients with painful hemiplegic shoulder.

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