The Professional Medical Journal
www.theprofesional.com

DOI: 10.29309/TPMJ/18.4264

ORIGINAL PROF-4264

POST-STROKE FOCAL HAND DYSTONIA;
BOTULINUM TOXIN AND TASK SPECIFIC TRAINING

Muhammad Umar[1], Tahir Masood[2], Mazhar Badshah[3]

1. PhD Scholar Rehabilitation Sciences,
Head of Physiotherapy Department,
Holy Family Hospital Rawalpindi.
2. PhD
Associate Professor,
Isra Institute of Rehabilitation Sciences,
Isra University Islamabad Campus.
3. FCPS Neurology
Associate Professor/ Head of Department,
Department of Neurology,
Pakistan Institute of Medical Sciences Islamabad.

Correspondence Address:
Muhammad Umar
Physiotherapy Department,
Holy Family Hospital Rawalpindi
physioumar@gmail.com

Article received on:
19/08/2017
Accepted for publication:
15/12/2017
Received after proof reading:
31/01/2018

ABSTRACT… Objectives: To determine the effects of Botulinum toxin A (BoNTA) with task specific training on hand function and quality of life in patients with post stroke focal dystonia of hand. **Study Design:** Randomized Controlled Trial. **Place and Duration of Study:** This study was conducted in Holy family hospital, The Neurocounsel and Chambeli Rehabilitation center from October 2015 to September 2016. **Methodology:** Both male and female patients suffering from stroke for at least 6 months with focal hand dystonia were included in this randomized controlled trial. 46 patients were recruited in the study through non probability purposive sampling and then were allocated to control (n=23) and experimental group (n=23) by random number list generated for 46 patients using SPSS software. Control group was provided with only task specific training while experimental group was provided with an injection of Botulinum Toxin A in addition to task-specific training. Data was collected from both groups at baseline and then after 8 weeks by using Action Research Arm Test (ARAT), Stroke specific quality of life (SS-QOL) and Arm dystonia disability scale (ADDS). **Results:** Although both groups showed significant improvements after training(P value <0.001) in both ARAT scale and SS-QOL but as shown by the difference of means of the groups, experimental group has shown more improvement than control group at the end of 8 weeks of intervention with P value<0.05. ADDS has also shown better results in reducing disability in experimental group as compared to control group. **Conclusion:** Botulinum toxin A prior to start of task specific training significantly improves outcome in post stroke focal hand dystonia patients than task specific training alone.

Key Words: Focal Dystonia, Quality of Life, Task Specific Training, Botulinum Toxin A, SS-QOL.

Article Citation: Umar M, Masood T, Badshah M. Post-stroke focal hand dystonia; Botulinum toxin and task specific training. Professional Med J 2018; 25(2):205-210. **DOI:**10.29309/TPMJ/18.4264

INTRODUCTION

Dystonia has been defined as abnormal twisting movements and repetitive movements or the abnormal postures in specific part / parts of body.[1] It is a painful and disabling condition. Dystonia can be classified based on body part involved, patient age, or underlying mechanism. Focal hand dystonia in musicians is one of the major types of dystonia that has received a vast attention over period of time.[2] Focal hand dystonia which develops secondary to some condition like stroke, Parkinsonism or brain injury is although very devastating but still ignored.

The prevalence of dystonia after stroke has not been thoroughly studied in larger studies but as per stroke registries of Lausanne and Ecuador its prevalence was found to be 17 and 29 % respectively.[3] The only national study found, reported the prevalence to be 25 %.[4] Dystonia not only limits the physical activity of the patient but also affects their quality of life significantly.[5] The quality of life of dystonic patient is not only affected by inability to perform actions but there are certain other factors that affect the quality of life of dystonic patient. These factors include alterations of mood, cognition, sleep and pain that have been developed as a result of dystonia.[6] Various treatment protocols have been used in the literature for treatment of focal hand dystonia in the past including Botox, deep brain stimulation, kinesio taping, sensory oriented training, splinting and extracorporeal shock wave therapy.[7-13]

In last few years concept of task specific training has gained importance in every aspect of

neurological rehabilitation. Task specific training has demonstrated positive results in treatment of focal dystonia.[14] As mentioned earlier various treatment protocols are available to treat focal dystonia of hand but mostly studies have not addressed what are effects on quality of life of patient with dystonia. In addition, up to our knowledge no study has specifically addressed hand dystonia after stroke with combination of Botulinum Toxin A and task specific training.

MATERIALS AND METHODS

A Randomized control trial was conducted in Holy family hospital, The Neurocounsel and Chambeli Rehabilitation center from Oct 2015 to Sep 2016 after approval from ethical committee of Rawalpindi Medical College and Allied Hospital, Rawalpindi and Isra University, Islamabad. Sample size was calculated using the WHO sample size calculator, with level of significance 5% and power of test as 95 %. 46 patients were recruited in the study through non probability purposive sampling and then allocated to control (n=23) and experimental group (n=23) by using random number list generated for 46 patients randomly allocating them in experimental group or control group using SPSS software. Both male and female patients suffering from stroke over the last 6 months or more and developed dystonia in the hand were included in the study. All other cases of dystonia including idiopathic, writer's cramp, Parkinson disease were excluded from the study. Control group was provided with only task specific training for 1 hour per day, 3 days a week for 8 weeks while experimental group was provided with task specific training 1 hour per day, 3 days a week for 8 weeks along with Botulinum Toxin A (Botox). The injected doses of botox for the patient in experimental group was 100 units which is equivalent to approximately 300-500 Units of Dysport (the other type of Botulinum Toxin A available). Botulinum toxin was injected in Flexor digitorum superficialis, Flexor digitorum profundus, Flexor carpi ulnaris, Flexor carpi radialis, Brachialis, biceps brachii, Triceps brachii, Extensor pollicis longus and Flexor pollicis Longus muscle, depending upon the type of focal dystonia once only, one week before starting task specific training. Data was collected from both groups at baseline and then after 8 weeks by using Action Research Arm Test (ARAT) scale, Stroke specific quality of life (SS-QOL) and arm dystonia disability scale (ADDS). 5 patients were unable to complete the study and were dropped from the study so only 41 patients completed the study i.e. control (n=20) and experimental group (n=21) Data was analyzed by using SPSS (v.21). After checking the normality of the data by using Shapiro wilk test and histogram, independent samples t test was used with level of significance 0.05% to compare the results between the groups and paired samples t test was used to compare the results within the groups. In addition correlation (Pearson and Spearman Rank Correlation) was also evaluated for different variables.

RESULTS

15(71.4%) patients were male and 6(28.6%) were female in experimental group and 9(45%) were male and 11(55%) were female in control group. Mean age of patients was 43.57±10.94 years in experimental group and 48.75±10.75 years in control group (P value=0.135). Patients whose right side was affected were 17(81%) in experimental group and 12(60%) in control group and those who had left side affected were 4(19%) in experimental group and 8(40%) in control group. In experimental group, 13(61.9%) of the patients suffered from ischemic stroke and in control 16(80%) of patients suffered from ischemic stroke. Likewise in experimental group, 8 (38.1%) suffered from haemorrhagic stroke and in control group 4 (20%) suffered from haemorrhagic stroke. According to the results of the study, mean±SD of Action Research Arm test (ARAT) at baseline was 30.24±7.65 in experimental group that improved to 41.14±8.13 at the end of 8th week with P value <0.001. Similarly in control group, mean±SD was 30.50±6.10 at baseline that improved to 35.50±6.22 at the end of 8th week showing marked difference in means of both groups at the end of week 8 with P value < 0.001. Similarly, mean±SD of Stroke specific quality of life (SS-QOL) in experimental group was 100.43±21.79 at baseline that improved to 150.95±38.13 at the end of the week 8 with P value < 0.001. In control group mean±SD was 106.35±23.71 at baseline that improved to 129.90 ±26.74 at the

end of week 8 with P value < 0.001. Comparison of means between the groups at the end of week 8 is shown in table I.

In Arm dystonia disability Scale (ADDS), at baseline highest frequency of patients 10(47.6%) were found under category 2 showing moderate disability and lowest 2(9.5%) in category 1 showing mild disability before intervention in experimental group but after 8 weeks of intervention, highest frequency 9(42.9%) was observed in category 1 that shows mild disability and lowest 1(4.8%) in 0 showing no disability. However in control group, at baseline, highest frequency 13(65%) was observed in category 2 showing moderate disability and lowest frequency 1(5%) was observed in category 1 showing mild disability. After 8 weeks of intervention in control group, highest frequency 15(75%) was observed in category 2 showing moderate disability and lowest frequency 2(10%) was observed in category 1 showing mild disability. Details of ADDS in both experimental and control group are given in Table-II.

Mode of Dystonic Patients according to ADDS was 2 in both experimental and control group at baseline and after 8 weeks of intervention, it was 1 in experimental group and 2 in control showing more improvement in experimental group.

Correlation was evaluated between ADDS and ARAT, ADDS and SS-QOL and ARAT and SS-QOL at baseline and after 8 weeks of intervention and the results obtained are shown in Table-III.

Variable	Experimental (Mean±SD)		Control (Mean±SD)		P value
	Baseline	After 8 weeks	Baseline	After 8 weeks	
ARAT	30.24±7.65	41.14±8.13	30.50±6.10	35.50±6.22	0.017*
SS-QOL	100.43±21.78	150.95±38.13	106.35±23.71	129.90±26.74	0.048*

Table-I. Comparison of Mean ±SD of ARAT and SS-QOL in Experimental and Control group before and after rehabilitation

ADDS Score	Experimental		Control	
	Baseline	After 8 weeks	Baseline	After 8 weeks
0	0	1(4.8%)	0	0
1	2(9.5%)	9(42.9%)	1(5%)	2(10%)
2	10(47.6%)	7(33.3%)	13(65%)	15(75%)
3	9(42.9%)	4(19%)	6(30%)	3(15%)

Table-II. Frequency of dystonic patients according to ADDS in both control and experimental group at baseline and after 8 weeks of intervention.

Correlation	Correlation Coefficient	P value
ADDS and ARAT at baseline	-0.880	0.000***
ADDS and ARAT after 8 weeks	-0.869	0.000***
ADDS and SS-QOL at baseline	-0.860	0.000***
ADDS and SS-QOL after 8 weeks	-0.836	0.000***
ARAT and SS-QOL at baseline	+0.897	0.000***
ARAT and SSQOL after 8 weeks	+0.90	0.000***

Table-III. Correlation between ADDS and ARAT, ADDS and SS-QOL and ARAT and SS-QOL at baseline and after 8 weeks with correlation coefficient and P values

DISCUSSION

To the best of authors' knowledge, this study is first of its type in Pakistan with regard to focal dystonia of hand after stroke and on combination of botox and task specific training for its treatment. The current study showed that quality of life as well as function of hand in patients with post stroke focal dystonia of hand showed marked

improvements when provided with 8 weeks of task specific training and Botox as well as with only task specific training. It was also observed in the current study that as the function of hand improves the quality of life of patients also improves and as dystonia decreases the overall function of hand increases, thus increasing the quality of life of the patients. Although studies are available in the literature which have showed positive effect of Botox and task specific training in improving function of hand after focal dystonia. But only few studies are available which have discussed the impact of dystonia on quality of life and has discussed its improvement with combination of both. Mueller et al did a study to find the impact of pallidal deep brain stimulation for improving quality of life in hand dystonia and reported significant improvements in health related quality of life after receiving treatment with deep brain stimulation. According to their results, with improvement in dystonia, quality of life also improves.[15] The results of their study support the current study.

Another study on non motor manifestations of dystonia by Stamelou et al reported an increase in the quality of life in primary focal dystonia of hand after treatment with botox however they reported more increased quality of life in patients of cervical dystonia than focal hand dystonia after receiving botox.[16] This variation in result might have occurred as they focused more on primary dystonia but in current study secondary focal dystonia that developed after stroke was considered that showed more responsiveness to botox and task specific training and thus provided more improvement in quality of life.

Lin et al did a study to find the effects of task specific training in improving upper limb function after stroke that was evaluated by using Fugl-Meyer Assessment scale for upper limb, and reported marked improvements in it along with improvement in quality of life.[17] The results of their study also support the result of the current study in which a positive correlation was observed in quality of life and hand functions. Caty et al did a study on the effect of botox on impairment, activity participation and quality of life and although reported increased effect of botox on tone but has shown no improvement in quality of life among patients with focal dystonia of hand.[18] Their results are not in accordance with the results of the current study. This contradiction might have occurred as they have used only botox in their study without focusing on the effectiveness of exercise in their study and in current study both botox and task specific exercises were used for treatment.

Kim et al reported a positive correlation between activities of daily living and quality of life among stroke population. They concluded that as the independence in activities of daily living improves, quality of life also improves in all domains.[19] Their study also supports the result of the current study, as the function of hand improved and patient became more independent in activities of daily living; the quality of life also improved.

Some limitations of study are that it has focused more on quality of life with function of focal dystonic hand; further studies with different designs should also be carried out to explore more domains of impairments caused by focal dystonia. In current study the male participants were more than the female that may have affected the outcomes; for future studies equal participation of both genders is recommended for generalizing the results. Different treatment protocols should also be tested for improvements in post stroke focal dystonia. Lack of proper follow up leading to drop outs in the study and treatment provided by different therapists in different settings are also some limitations that must be addressed in future studies.

CONCLUSION

It is concluded from the study that both botulinum toxin type A and task specific training when given in combination have better results in improving the function of dystonic hand as well as in improving the quality of life of patients with post stroke focal hand dystonia, as compared to task specific training alone.

ACKNOWLEDGEMENT

This research work is the part of PhD in

Rehabilitation Sciences at Isra Institute of Rehabilitation Sciences, Isra University Islamabad campus.

REFERENCES

1. Zoons E, Dijkgraaf M, Dijk J, Van Schaik I, Tijssen M. **Botulinum toxin as treatment for focal dystonia: a systematic review of the pharmaco-therapeutic and pharmaco-economic value. Journal of neurology.** 2012;259(12):2519-26. doi: 10.1007/s00415-012-6510-x.

2. Skogseid I. **Dystonia–new advances in classification, genetics, pathophysiology and treatment.** Acta Neurologica Scandinavica. 2014;129(s198):13-9. doi: 10.1111/ane.12231.

3. Park J. **Movement disorders following cerebrovascular lesion in the basal ganglia circuit.** Journal of movement disorders. 2016;9(2):71. doi: 10.14802/jmd.16005.

4. Umar M, Badshah M, Baig MS. **Frequency of Dystonia Among Post Stroke Patients in Pakistan.** Ann Pak Inst Med Sci. 2016:142.

5. Albanese A, Bhatia K, Bressman SB, DeLong MR, Fahn S, Fung VS, et al. **Phenomenology and classification of dystonia: a consensus update.** Movement Disorders. 2013;28(7):863-73. doi: 10.1002/mds.25475. Epub 2013 May 6.

6. Conte A, Berardelli I, Ferrazzano G, Pasquini M, Berardelli A, Fabbrini G. **Non-motor symptoms in patients with adult-onset focal dystonia: Sensory and psychiatric disturbances.** Parkinsonism Relat Disord. 2016 Jan;22 Suppl 1:S111-4. doi: 10.1016/j.parkreldis.2015.09.001. Epub 2015 Sep 3.

7. Benninger DH, Lomarev M, Lopez G, Pal N, Luckenbaugh DA, Hallett M. **Transcranial direct current stimulation for the treatment of focal hand dystonia.** Movement Disorders. 2011;26(9):1698-702. doi: 10.1002/mds.23691. Epub 2011 Apr 14.

8. Pandey S. **A practical approach to management of focal hand dystonia.** Annals of Indian Academy of Neurology. 2015;18(2):146. DOI: 10.4103/0972-2327.156563.

9. Sanger TD, Kukke SN, Sherman-Levine S. **Botulinum toxin type B improves the speed of reaching in children with cerebral palsy and arm dystonia: an open-label, dose-escalation pilot study.** Journal of child neurology. 2007;22(1):116-22. DOI: 10.1177/0883073807299975.

10. Santamato A, Notarnicola A, Panza F, Ranieri M, Micello MF, Manganotti P, et al. **SBOTE study: extracorporeal shock wave therapy versus electrical stimulation after botulinum toxin type a injection for post-stroke spasticity–a prospective randomized trial.** Ultrasound in medicine & biology. 2013;39(2):283-91.

11. Siniscalchi A, Gallelli L, Labate A, Malferrari G, Palleria C, De Sarro G. **Post-stroke movement disorders: clinical manifestations and pharmacological management. Current neuropharmacology.** 2012;10(3):254-62. doi: 10.2174/157015912803217341.

12. Trompetto C, Avanzino L, Bove M, Marinelli L, Molfetta L, Trentini R, et al. **External shock waves therapy in dystonia: preliminary results.** European journal of neurology. 2009;16(4):517-21. doi: 10.1111/j.1468-1331.2008.02525.x.

13. Zeuner KE, Bara□Jimenez W, Noguchi PS, Goldstein SR, Dambrosia JM, Hallett M. **Sensory training for patients with focal hand dystonia.** Annals of neurology. 2002;51(5):593-8. DOI: 10.1002/ana.10174.

14. Berque P, Gray H, McFadyen A. **A combination of constraint-induced therapy and motor control retraining in the treatment of focal hand dystonia in musicians: a long-term follow-up study.** Med Probl Perform Art. 2013;28(1):33-46.

15. Mueller J, Skogseid IM, Benecke R, Kupsch A, Trottenberg T, Poewe W, et al. **Pallidal deep brain stimulation improves quality of life in segmental and generalized dystonia: Results from a prospective, randomized sham□controlled trial.** Movement disorders. 2008;23(1):131-4. DOI: 10.1002/mds.21783.

16. Stamelou M, Edwards MJ, Hallett M, Bhatia KP. **The non-motor syndrome of primary dystonia: clinical and pathophysiological implications.** Brain. 2011;135(6):1668-81. doi: 10.1093/brain/awr224. Epub 2011 Sep 20.

17. Lin K-c, Chang Y-f, Wu C-y, Chen Y-a. **Effects of constraint-induced therapy versus bilateral arm training on motor performance, daily functions, and quality of life in stroke survivors.** Neurorehabilitation and Neural Repair. 2009;23(5):441-8. doi: 10.1177/1545968308328719. Epub 2008 Dec 31.

18. Caty GD, Detrembleur C, Bleyenheuft C, Deltombe T, Lejeune TM. **Effect of upper limb botulinum toxin injections on impairment, activity, participation, and quality of life among stroke patients.** Stroke. 2009;40(7):2589-91. doi: 10.1161/STROKEAHA.108.544346. Epub 2009 Apr 30.

19. Kim K, Kim YM, Kim EK. **Correlation between the activities of daily living of stroke patients in a community setting and their quality of life.** Journal of physical therapy science. 2014;26(3):417-9. doi: 10.1589/jpts.26.417.

A mistake repeated more than once is a decision.

– Paulo Coelho –

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Muhammad Umar	The study was conceptualized by Muhammad Umar and Mazhar Badshah. Data collection was completed by Muhammad Umar and Mazhar Badshah. Muhammad Umar drafted the manuscript. Tahir Masood designed, supervised the project and revised the manuscript.	
2	Tahir Masood		
3	Mazhar Badshah		