Does the reduction of pulse width stimulus in ECT reduce the number of treatment applications required in a consecutive sample of patients?

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Introduction

Electroconvulsive therapy (ECT) has been shown to be effective in the face of treatment resistant and life threatening mental disorders but has well established cognitive side effects. Studies have shown that 0.5ms pulse width ECT has fewer cognitive side effects than pulse widths of 1ms or greater with no reduction in clinical efficacy. The ECT department of the acute psychiatric unit in Galway University Hospital introduced a new ECT machine, the Mectra 5000Q in November 2018. The new pulse width of treatment application was reduced to one third of that administered by the previous model, the Mectra 5000 (0.5 miliseconds, versus 1.5 miliseconds).

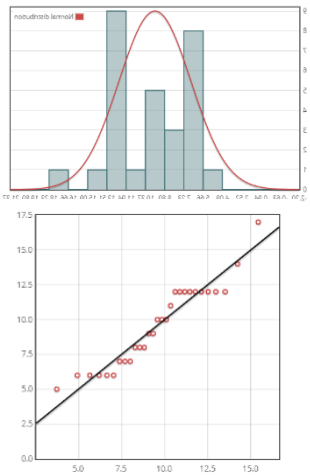
Objective

To ascertain if fewer applications of ECT were required to achieve remission with a narrower pulse width stimulus of 0.5ms.

Methods

The ECT register in the department of psychiatry, GUH was examined for numbers of patients who had received treatment at a pulse width of 0.5ms and 1.5ms respectively. The maximum sample size available for treatment applied at a pulse width of 0.5ms was 26 at the time of the study. A corresponding sample of 26 consecutive patients were chosen from the 1.5ms treatment group. These data spanned a three year period. It was assumed that remission was achieved when treatment ceased. Data was collated in an excel spread sheet and tests for normal distribution were applied. To test the hypothesis that a statistically significant fewer number of treatments was required to achieve remission with a 0.5ms pulse width stimulus, an independent samples t-test was performed assuming unequal variance.

Fig 1 Histogram and Q-Q plot of 1.5ms treatment group [skew = 0.35, kurtosis = -0.34]



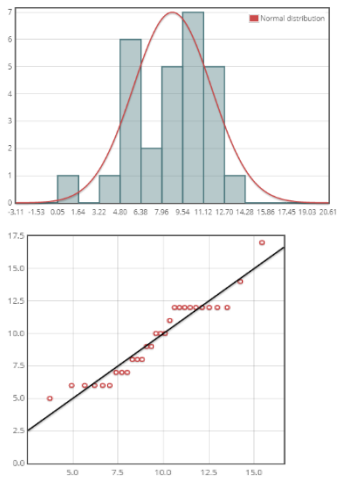
Results

The 1.5ms pulse width group, n=26, was associated with a mean number of treatments = 9.6, standard deviation = 2.95. By comparison, the 0.5ms pulse width group, n=26, was associated with a numerically smaller mean number of treatments = 8.7, standard deviation = 2.96. Both groups were sufficiently normal (figures 1&2) for an independent samples t-test to be performed. The output from the independent t-test is displayed in figure 3. The t Stat = 1.12, less than the t Critical two-tail value of 2.01. The P value for this result is 0.27

t-Test: Two-Sample Assuming Unequal Variances		
	1.5ms pulse width	0.5ms pulse width
Mean	9.77	8.85
Variance	8.42	9.18
Observations	26.00	26.00
Hypothesized Mean Difference	0.00	
df	50.00	
t Stat	1.12	
P(T<=t) one-tail	0.13	
t Critical one-tail	1.68	
P(T<=t) two-tail	0.27	
t Critical two-tail	2.01	

Fig 3: output from independent t test

Fig 2 Histogram and Q-Q plot of 0.5ms treatment group [skew = -0.54, Kurtosis = 0.16]



Discussion

The mean number of treatments required to achieve remission when giving ECT at a pulse width of 0.5ms was 8.7, almost one less than the mean of 9.6 for the 1.5ms pulse width group. The null hypothesis states that there is no difference in the means of these two samples. The t Stat value of 1.12 is smaller than the t Critical value of 2.01, indicating that the null hypothesis should be accepted. However as the p value = 0.27, we cannot, with 95% confidence accept the null hypothesis therefore a difference between the two means exists. In practical terms, these results appear to indicate that patients receiving 0.5ms pulse width ECT required one less treatment application to achieve remission when compared with the 1.5ms pulse width group. Patients undergo general anaesthetic for administration of ECT treatment. Reducing the number of ECT applications required, even by one consequently reduces the number of occasions that general anaesthetic is administered which confers a clear benefit. Additionally, studies indicate that a 0.5ms pulse width stimulus is associated with fewer cognitive side effects than pulse widths of 1ms or greater.

Conclusion

Patients undergoing ECT in the department of psychiatry in Galway University hospital are benefitting from the introduction of the new ECT machine on two fronts; an overall reduction in the number of treatment applications required to achieve remission as well as a reduction in the risk of cognitive side effects.

References

Brunner, I., Grözinger, M. Brief vs. ultrabrief pulse ECT: focus on seizure quality. *Eur Arch Psychiatry Clin Neurosci* **268,** 831–838 (2018)

Spaans, H., Kho, K., et al. . Efficacy of ultrabrief pulse electroconvulsive therapy for depression: a systematic review. *Journal of Affective Disorders*, **150**, 720-726 (2013)

Verwijk et al. Relapse and long-term cognitive performance after brief pulse or ultrabrief pulse right unilateral electroconvulsive therapy: A multicenter naturalistic follow up. *Journal of Affective Disorders*,, **184** 137-144 (2015)