A Statistical Re-Examination Of The Effect Of Complex Ventricular Arrhythmias During Hemodialysis On Blood Pressure

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Citation

Abstract

In a paper titled 'Patients With Complex Ventricular Arrhythmias During Hemodialysis Suffer From Unstable Blood Pressure' published in The Internet Journal of Nephrology (Volume 2 Number 1), authors have divided 18 patients undergoing hemodialysis into two groups ,one with those 6 who showed Complex Ventricular Arrhythmias (CVA+) and the other 12 who did not (CVA-). Though not mentioned in the article, it may be assumed that the researchers have randomly selected the patients from study population or incorporated some element of randomisation which is a requirement for application of significance tests. A number of variables on background of the patients and clinical investigation revealed no statistically significant difference between CVA+ and CVA- patients. Authors have concluded that the patients with CVA (CVA+) during hemodialysis have instability of blood pressure. But the study is not so powered to conclude this. It is worth mentioning here that a statistical test's power is the probability that the test procedure will result in statistical significance. It is the probability of correctly rejecting the null hypothesis (1-?). Power increases when effect size and /or sample size increases. Considering only the blood pressure the following tables have been prepared from Table-1 of the aforesaid paper.

Figure 1

Group	Difference Max.SBP-Min.SBP Mean ± SE	Within the group Comparison Paired t test	Between the group Comparison Unpaired t test
CVA+ (n=6)	41.7 ± 8.2 SD = ± 20.09	t = 5.08 p < 0.01	t = 2.18 p < 0.05
CVA- (n=12)	18.2 ± 6.4 SD = ± 22.17	t = 2.84 p < 0.02	Power = 0.5359 (For α = 0.05)

Figure 2

Group	Difference Max.DBP-Min.DBP Mean ± SE	Within the group Comparison Paired t test	Between the group Comparison Unpaired t test
CVA+ (n=6)	24.0 ± 5.2 SD = ± 12.74	t = 4.62 p < 0.01	t = 1.71 p > 0.05
CVA- (n=12)	12.0 ± 4.2 SD = ± 14.55	t = 2.86 p < 0.02	Power = 0.3636 (For α = 0.05)

Within the group comparison for testing the statistical significance of mean of difference (max.-min.) using paired t test resulted statistically significant in CVA+ and CVA- groups for SBP (systolic blood pressure) as well as DBP (diastolic blood pressure). Thus both CVA+ and CVA- groups show significant difference (max.-min.) as regards SBP and DBP. So it may be argued that both the groups exhibit instability in SBP and DBP.

It may be better to compare the mean difference between the groups rather than comparing the two measurements separately[1]. It can be seen here that comparing the mean min.DBP between CVA+ and CVA- groups results significant, but comparing the difference (max.DBP - min.DBP) shows non-significance. So it may be said that the changes occurring in DBP in both the groups do not differ significantly. Both CVA+ and CVA- show similar pattern of instability as regards DBP. However, the groups differ significantly on changes occurring in SBP.

Interpretation of results of significance tests should also include statistical test's power. The post-hoc power analysis[2] revealed inadequate power in spite of large effect size, the reason being small size of groups. Thus validity of conclusion based on results of less powered study may be questionable.

The higher value of SD (standard deviation) at certain places

suggests transformation of data preferably log transformation before application of t test. If this would have been done some findings might have reversed.

It is worth mentioning here that there seems some computational error since, Mean(max.SBP - min.SBP) = Mean(max.SBP) - Mean(min.SBP) has not been observed in both the groups. However, Mean(max.DBP - min.DBP) = Mean(max.DBP) - Mean(min.DBP) has been observed in CVA+ group but not in CVA- group.

Lastly, it may be concluded that patients of both CVA+ and CVA- groups may show unstable blood pressure as regards SBP and DBP. Pattern of instability in DBP may be similar in both the groups. However, the pattern of instability in SBP may differ between the groups.

References

1. Vickers A.J., Altman D.G. Analysing controlled trials with baseline and follow up measurements. British Medical Journal, 2001; 323 : 1123-24 (10 November).
2. Faul F., Erdfelder E. GPOWER: A priori, post-hoc, and compromise power analysis for MS-DOS (Computer Program). 1992, Bonn, FRG: Bonn University, Dep. of Psychology.

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