Understanding data and its analysis for interpretation – Correct interpretation and safety matters!

The role of regional anesthesia and analgesia for surgeries is well documented. Its role becomes more important for long duration complex procedures like for onco-surgeries in view of it's beneficial effect including better patient satisfaction. Recently, there has been concern about the relation between anesthetic technique and cancer recurrence.[1,2] It is emphasized that the perioperative stress leads to metabolic, neuroendocrine, hematological, and inflammatory/immunological responses.[1-3] This in turn is associated with immune suppression and possibly provides a milieu for possible tumour cell proliferation leading to cancer recurrence or metastases.[3] The regional anesthesia has been reported to have some beneficial effect with regards to cancer recurrence. Regional anesthesia attenuates the potential of cancer progression by attenuation of the surgical stress response, better analgesia, and reduced opioid usage and direct protective action of local anesthetic on cancer cells migration.

This issue is accompanied by an original article titled, "*Cervical epidural analgesia combined with general anesthesia for head and neck cancer surgery: a randomized study*".[4] In this small study on 30 patients undergoing oral, hypo-pharyngeal and laryngeal cancers surgeries, the authors hypothesized that cervical epidural analgesia (cervical epidural catheter placed at C 6 – T1 level in sitting position using loss of resistance to air technique without use of ultrasound or fluoroscope) may reduce opioid, anesthetic requirements and stress response.[4] The authors have administered 0.2% ropivacaine via epidural catheter as bolus followed by infusion. Also, all patients received background morphine infusion at the rate 0.01 mg/kg/hour. Authors reported that, "there was significantly lower consumption of morphine ($P < 0.0001$), isoflurane (P-0.004) and vecuronium (P-0.001) in cervical epidural group along with general anesthesia compared with the control group (received only general anesthesia)".[4]

The choice of any analgesic technique would depend on balance between its benefits and risk. It is reasonable to minimize the use of volatile anesthetics and opioids by using regional anesthesia technique as part of balanced anesthesia, especially for onco-surgeries. However they have not included concern and risk associated with the procedure and outcome of placement of cervical epidural block. The authors reported that three patients (20%) in cervical epidural group to have hemodynamic compromise as compared to none in control group.[4] In view of availability of other analgesic techniques (probably more safer), the comparison of adverse events becomes essential. The technique of cervical epidural placement should be undertaken in experienced hand and probably under image guidance. The authors have not reported the recovery characteristics profile of the patient but may have been affected by use of ropivacaine (even with 0.2%) through the cervical epidural route. Recovery characteristics was not aimed and may be important in these studies where in risk also needs to be assessed.

Another important aspect of any study is the appropriate interpretation of data based on result analysis. Clinical studies are conducted to test the superiority usually (inferiority and equivalence trials are also conducted) of an intervention over a control (cervical epidural along with general anesthesia vs. general anesthesia alone in this study).[4-7] The outcomes of such studies are evaluated based on two aspects– statistical (result-based merit) and clinical relevance of the outcome (process-based merit or non-statistics merits).[5-8] Both need to be considered in a study for making a meaningful conclusion. The reported morphine consumption is 8.9 ± 0.95 and 7.1 ± 1.02 in the two groups with P value <0.0001.[4] Though the difference is statistically significant, the difference may not be clinically relevant due to lesser consumption of the drug in either group.

For the interpretation of the statistical analysis, some additional aspects also need to be considered. The two statistical tools—P value and Confidence Interval (CI)—are usually reported.[6,7] They are related tools but provide different information of the data collected in the study. The P value does not prove the superiority of an intervention over the other but is just denotes whether the null hypothesis rejected based on observed data analysis. In in other words, whether the observed difference in the outcome among the groups is due to random chance or not.So, the interpretation based solely on P values may be misleading.[8,9] The P value in this study remains statistically significant and that is why authors concluded the beneficial effect of cervical epidural in patients undergoing head and neck surgery. However, this interpretation solely based on P value may be misleading as it does not provide any estimate of the true difference among the morphine consumption (or other parameters) in the two groups.[7-9]

For such estimation of true difference, we need to calculate CI i.e., 95% CI of the mean difference in the morphine consumption among the two groups. We need to understand the importance of CI as well, which conveys more understanding of the results for interpretation. CI provides magnitude of effect, variability and describes the uncertainty in the estimated difference (e.g., in the morphine consumption).[4,7-9] In other words, it provides a range of true effect of difference in the outcome parameters of the study. If there is no difference in means of the observed value among groups, then the difference shall be zero. Conventionally CI is usually reported as 95%CI which in simpler words may be understood as 95% chance of true value within this range when study is repeated 100 times. When 95% CI contains the null value, it can then be assumed that there is no statistically meaningful or statistically significant difference between the groups for which mean difference is being compared. The values reported for the 95% CI of mean difference in morphine consumption in the two groups is 1.8 (−2.41, 1.18).[4] The reported data with significant P value would have been of value if the 95% CI would not have value 0 in this interval. Hence, we can conclude that actually no difference exists in the morphine consumption among the groups in the reported study.[4] Hence, based on these understanding, the reported study remains inconclusive. Similarly, mean difference (95% CI) of other observed values including end-tidal isoflurane (%) and vecuronium (mg/hr) are 0.3 (−0.45 to 0.14) and 1.5(−1.90 to 1.09) (P 0.004 and 0.001) respectively are also appears inconclusive for any meaningful conclusion for beneficial effect.[4]

To conclude, P value and CI are important statistical tools that provide appropriate information of the data analysis and helps in making not only statistical significance but also has a meaningful conclusion in clinical settings.

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