Original Article

Relationship between Head and Neck Anthropometry in Sonographic Assessment of the Corner Pocket for Ultrasound – Guided Supraclavicular Plexus Blocks

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Abstract

Background: supraclavicular approach has steadily grown throughout various surgeries as a regional anesthesia technique. Ultrasound is suggested to increase the accuracy and safety. This study was aimed to assess the relationship between effectiveness of head and neck anthropometry and sonographic supraclavicular angle as a safety measure.

Methods and Materials: 34 patients were evaluated using an ultrasonography device with a linear probe to assess angle of measurement. Besides, using metric measurements, head and neck anomalies were examined. Pearson coefficient analysis was used for data analysis.

Results: Based on the results of this study (Table 2), except for age, gender and neck width of the patients, the results did not show a significant relationship. Also, regression calculation studies clearly indicated a higher correlation and alignment of factors such as width, length and circumference long distance in comparison with short distance.

Conclusion: The result showed that there was a correlation between the studied angles and the factors of the study with more emphasis on the effective role of ultrasound in the process of anesthetizing the patient through supraclavicular.

Keywords: Supraclavicular, Anesthesia, Ultrasound

Please cite this article as: Hosseini B, Dabir S, Mosaffa F, Seyed Alshohadaei SM, Baghizadeh F. Relationship between Head and Neck Anthropometry in Sonographic Assessment of the Corner Pocket for Ultrasound – Guided Supraclavicular Plexus Blocks. J Cell Mol Anesth. 2019;4(3):75-81.

Introduction

Supraclavicular plexus block under ultrasound guidance is a convenient and practical method for brachial plexus block; in this method, the nerves can be localized, therefore complications reduced and success rate increases (1). Ultrasound provides an instant imaging of the anatomical structures. Therefore, the neural networks, pleural effusions, and vessels are carefully detectable. On the other hand, this method can provide a snapshot of the distribution of local anesthetics (2). Recently, brachial plexus block with supraclavicular approach has been described laterally and is recommended by many experts (3, 4). This lateral angle is created between the first rib at the bottom, the subclavian artery in the inner part, and the brachial plexus in the upper part (5-7). This angle has many variations in the depth of the brachial plexus of patients who are candidates for this type of block, depending on the patient's age, sex and race (8-10). This study was aimed to assess the relationship between effectiveness of head and neck anthropometry and the exact sonographic supraclavicular angle as a safety measure in an Iranian patient population.

Methods

In this descriptive study, after taking informed written consent, 34 patients (21 males and 13 females) aged between 22 and 65 years entered the study during one year period (April 2017- April 2018); random allocation was used for grouping. Using an ultrasound with a linear probe, the angular angle measured. The desired angle was between the subclavian artery and the clavicle. Therefore, the tangential and direct line closes the clavicular to the last possible point in the subclavian artery. Thus, the position of this angle was estimated using metric measurement tools. The anthropometric features of the head and neck was examined and the lateral angles were compared with each of these numbers. Data were analyzed using SPSS software, version 14. Pearson correlation coefficient at 1% and 5% levels were considered significant.

This study was approved by the Ethics Committee, Research Deputy, Shahid Beheshti University of Medical Sciences (registered as IR. SBMU. RETECH.REC.1396.21710299).

Results

After calculating the Pearson coefficient (at two significant levels of 1% and 5%) for the short distance (SD) results (Table 1), there was no significant relationship between the investigated factors and the SD. However, after analysis with Pearson coefficient for long distance (LD) and comparing the parameters of the study with this factor, different results were obtained. Based on the results of this study (Table 2), except in cases such as age, gender and neck width of the patients, the results did not show a significant relationship. Other cases with the occurrence and appearance of significant results between LD and the factors studied.

All of these results in studies of regression calculation (correlation analysis of variables) clearly indicate a higher correlation and alignment of factors such as width, length and circumference LD in comparison with SD (Figure 1, 2).

Discussion

With the increasing expansion of non-invasive techniques or the development of minimally invasive procedures in the implementation of surgical procedures and anesthetic protocols, the use of techniques and instruments in these cases is also expanding. The implementation of ultrasound guide surgery is one of the relatively new and popular methods around the world. The use of ultrasound guidance has also been expanded in anesthetic related topics. This method, while securing safety, reduces the risk of general anesthesia in the patient.

One of the techniques of anesthesia use supraclavicular to perform anesthetic procedures. Supraclavicular approach for brachial plexus block, first described in year 1911 (by Kulenkampfin) (10). The use of this method has potential risks for the patient. The use of ultrasound guidance is also used in this area in order to accurately determine the location and the correct and safe implementation of anesthesia. Yadav et al. (2016) investigated the depth of lateral angle in the supraclavicular block using ultrasound guides, which based on the results, weight and body mass index (BMI) were correlated with angle depth. However, the depth of this angle was not significantly correlated with the patient's age and height (11). Brown et al. measured the distance of the skin to the brachial plexus using MRI (in men and women). Their study showed that the depth of the brachial plexus in the supraclavicular area was highly variable (12).

The present study investigates various factors involved in the implementation of anesthesia under ultrasound guidance through supraclavicular region. Results of multiple measurements and statistical studies have shown the effectiveness of using ultrasound in the anesthetic process through supraclavicular region. Meanwhile, the proportion of factors measured by the SD staff is less than the proportion of the same values with LD. Of course, in a comprehensive and general view, it should be noted that due to the amount of distribution and the correlation between the information recorded and the information obtained from the calculation of effective factors in the use of ultrasound techniques, the results emphasize the acceptability of the use of ultrasound in such a protocol.

Table 1: Study parameters compared with short distance (SD) with no significant relationship. Pearson coefficient analysis results at 1% and 5% significant levels.

		SD	**Neck-circumference**	**gender**	**age**	**Neck-length**	**Head-height**	**Stemum-tragus-length**	**Neck-with**
SD	Pearson Correlation	1	0.342	-0.019	0.086	-0.238	0.266	0.135	0.416
	Sig.(2-talied)		0.048	0.913	0.627	0.176	0.128	0.445	0.014
	N	34	34	34	34	34	34	34	34
Neck-circumference	Pearson Correlation	0.342	1	-0.499	-0.141	-0.239	0.110	0.144	0.672
	Sig.(2-talied)	0.048		0.003	0.428	0.173	0.537	0.417	0.000
	N	34	34	34	34	34	34	34	34
gender	Pearson Correlation	-0.019	-0.499	1	-0.044	0.223	0.100	0.282	-0.315
	Sig.(2-talied)	0.913	0.003		0.804	0.204	0.572	0.106	0.070
	N	34	34	34	34	34	34	34	34
age	Pearson Correlation	0.086	-0.141	-0.044	1	0.026	0.362	-0.032	0.087
	Sig.(2-talied)	0.627	0.428	0.804		0.884	0.035	0.858	0.625
	N	34	34	34	34	34	34	34	34
Neck- length	Pearson Correlation	-0.238	-0.239	0.223	0.026	1	0.038	0.120	-0.209
	Sig.(2-talied)	0.176	-0.173	0.204	0.884		0.830	0.499	0.236
	N	34	34	34	34	34	34	34	34
Head-height	Pearson Correlation	0.266	-0.110	0.100	0.362	0.038	1	-0.032	-0.010
	Sig.(2-talied)	0.128	0.537	0.572	0.035	.830		0.855	0.956
	N	34	34	34	34	34	34	34	34
Stemum-tragus-length	Pearson Correlation	0.135	0.144	0.282	-0.032	0.120	-0.032	1	0.080
	Sig.(2-talied)	0.445	0.417	0.106	0.858	0.499	0.855		0.653
	N	34	34	34	34	34	34	34	34
Neck-with	Pearson Correlation	0.416	0.672	-0.315	0.087	-0.209	-0.010	0.080	1
	Sig.(2-talied)	0.014	0.000	0.070	0.625	0.236	0.958	0.653	
	N	34	34	34	34	34	34	34	34

Table 2: Study parameters compared with long distance (LD). Pearson coefficient analysis results at 1% and 5% significant levels.

		LD	Neck-circumference	Gender	Age	Neck-length	Head-height	Stemum-tragus-length	Neck-with
LD	Pearson Correlation	1	0.394	-0.011	-0.070	-0.129	0.342	0.411	0.410
	Sig.(2-talied)		0.021	0.950	0.693	0.467	0.048	0.016	0.016
	N	34	34	34	34	34	34	34	34
Neck-circumference	Pearson Correlation	0.394*	1	-0.499**	-0.141	-0.239	0.110	0.144	0.672**
	Sig.(2-talied)	0.021		0.003	0.428	.0173	0.537	0.417	0.000
	N	34	34	34	34	34	34	34	34
Gender	Pearson Correlation	-0.011	-0.499	1	-0.044	0.223	0.100	0.282	-0.315
	Sig.(2-talied)	0.950	0.003		0.804	0.204	0.572	0.106	0.070
	N	34	34	34	34	34	34	34	34
Age	Pearson Correlation	-0.070	-0.141	-0.044	1	0.026	0.362	-0.032	0.087
	Sig.(2-talied)	0.693	0.428	0.804		0.884	0.035	0.858	0.625
	N	34	34	34	34	34	34	34	34
Neck-length	Pearson Correlation	-0.129	-0.239	0.223	0.026	1	0.038	0.120	-0.209
	Sig.(2-talied)	0.467	0.173	0.204	0.884		0.830	0.499	0.236
	N	34	34	34	34	34	34	34	34
Head-height	Pearson Correlation	0.342	0.110	0.100	0.362	0.038	1	-0.032	-0.010
	Sig.(2-talied)	0.048	0.537	0.572	0.035	0.830		0.855	0.956
	N	34	34	34	34	34	34	34	34
Stemum-tragus-length	Pearson Correlation	0.411	0.144	0.282	-0.032	0.120	-0.032	1	0.080
	Sig.(2-talied)	0.016	0.417	0.106	0.858	0.499	0.855		0.653
	N	34	34	34	34	34	34	34	34
Neck-with	Pearson Correlation	0.410	0.672	-0.315	0.087	-0.209	-0.010	0.080	1
	Sig.(2-talied)	0.016	0.000	0.070	0.625	-0.236	0.956	0.653	
	N	34	34	34	34	34	34	34	34

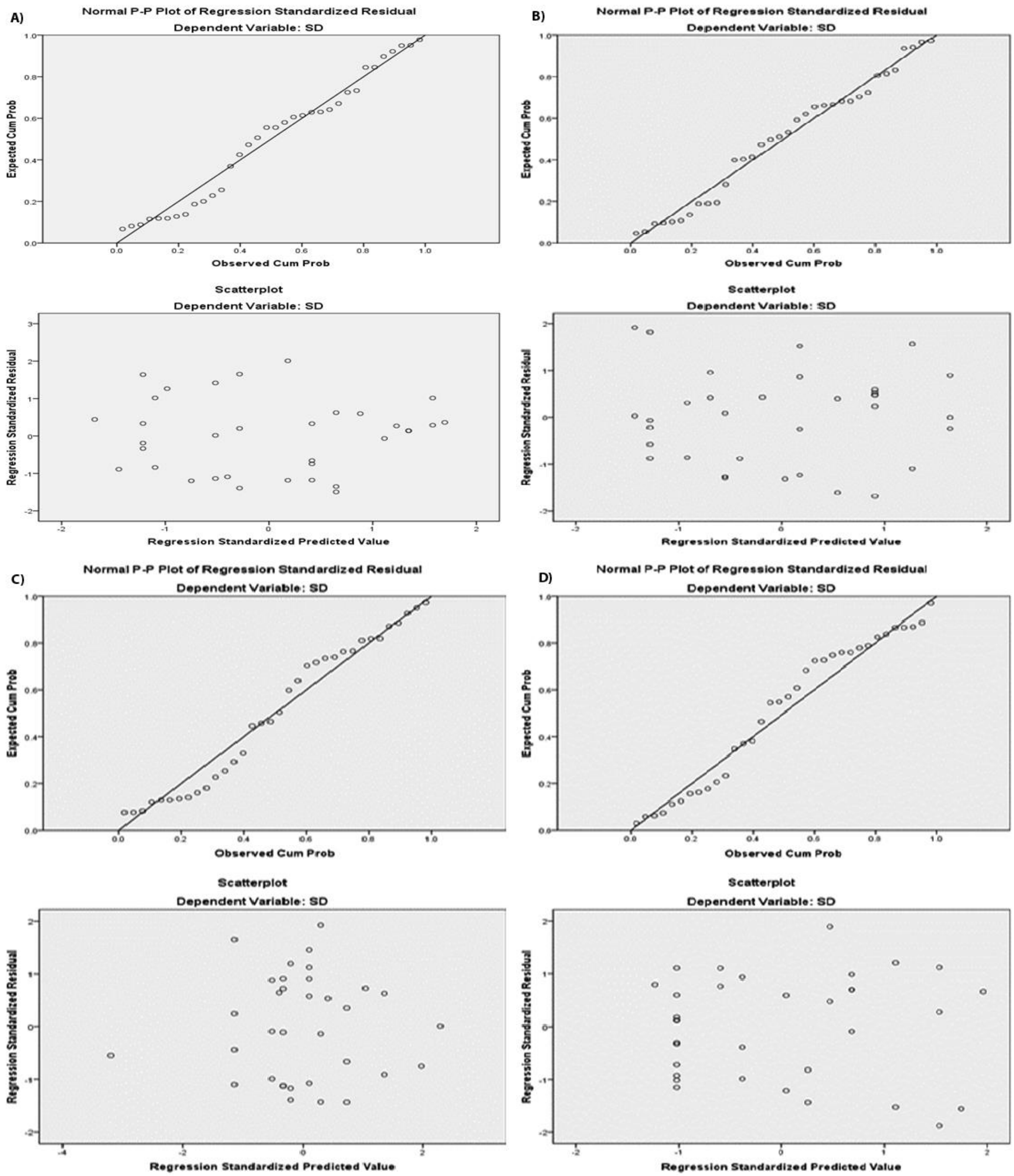

Figure 1. Correlation of data (neck circumference "A”, neck with "B”, sternum tragus length "C" and head height "D") with SD, through regression calculations using SPSS statistical software. Observations confirm the existence of a positive linear relationship between all factors with SD. However, the amount of data dispersion is relatively high and does not show good coherence.

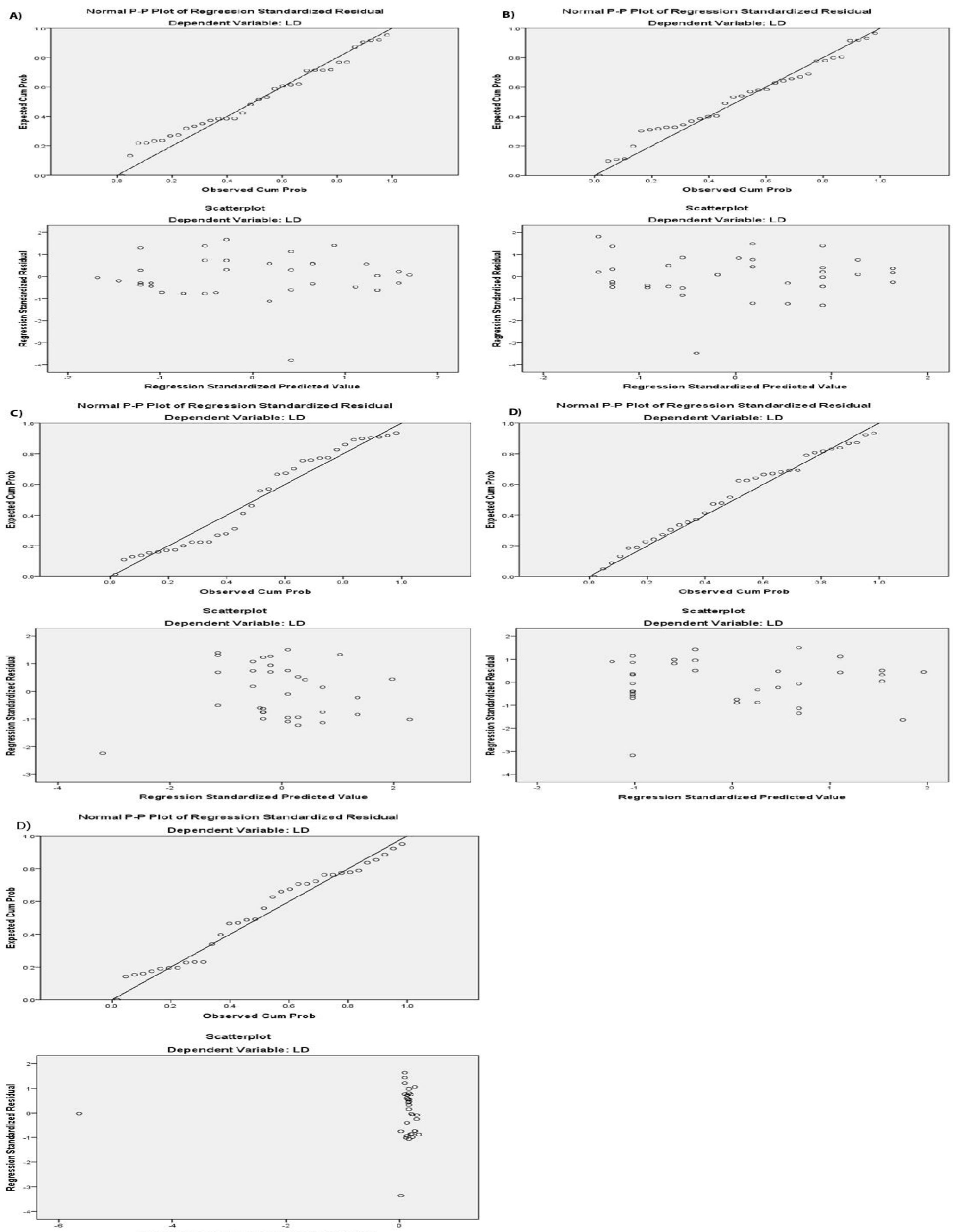

Figure 2. Correlation of data (neck circumference "A", neck with "B", sternum tragus length "C" head height "D" and neck length" E") with LD, through regression calculations using SPSS statistical software. Observations confirm the existence of a positive linear relationship between all factors with LD. However, the correlation and density of data in LD is far more accurate than comparing these data with SD.

Conclusion

The result of the current study demonstrated that there is a correlation between the studied angles and the factors of the study. This emphasizes on the effective role of ultrasound in the process of anesthetizing the patient through supraclavicular. However, the implementation of a similar study with a higher patient population, more time interval and more criteria in measurement of patient data can further elucidate the results and possibly demonstrate more practical measures using translational studies.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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