**INTER-ARM AND INTER-LEG SYSTOLIC BLOOD PRESSURE DIFFERENCES IN AORTIC DISSECTION**

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**SUMMARY**

**Background:** Inter-arm and inter-leg blood pressure (BP) differences are clues to diagnosis of aortic dissection.

**Methods:** We reviewed 168 aortic dissection cases from January 1999 to September 2005 in a medical center in Taiwan. Thirty-eight cases were suitable for inclusion in our study. Blood pressure of the four limbs were taken on arrival at our emergency department (ED). We used SPSS version 11.5 for statistical analysis of data. Chi-squared test was used for the comparison of inter-limb blood pressure difference on arrival at our ED.

**Results:** There were 30 males and 8 females whose ages ranged from 29 to 91 years, with a mean age of 58.7 ± 14 years. Systolic blood pressure on arrival at our ED ranged from 86 to 264 mmHg, with a mean of 175 ± 43.3 mmHg. The inter-arm blood pressure difference was 14.5 ± 15.7 mmHg, and the inter-leg difference was 12.5 ± 14.3 mmHg. The duration of hospital stay was 12.9 ± 11.8 days. The group with inter-arm blood pressure difference of ≥ 14.5 mmHg had a lower systolic blood pressure on arrival at the ED than the group with inter-arm BP difference of < 14.5 mmHg (164.9 ± 46.6 vs. 180.3 ± 41.6 mmHg; p = 0.004). The group with inter-leg BP difference of ≥ 12.5 mmHg had a longer hospital stay than the group with inter-leg BP difference of < 12.5 mmHg. (17.5 ± 17.5 vs. 10.2 ± 5.6 days; p = 0.004). For age and hospital stay, there was no obvious discrepancy between the inter-arm BP difference of ≥ 14.5 mmHg (p = 0.4) and < 14.5 mmHg (p = 0.077). For age and systolic blood pressure on arrival at our ED, there was no significant difference between the inter-leg BP difference of ≥ 12.5 mmHg (p = 0.28) and < 12.5 mmHg (p = 0.113).

**Conclusion:** The group with inter-arm BP difference of ≥ 14.5 mmHg had a lower systolic blood pressure on arrival at the ED, possibly because of the cardiac output being influenced after dissection. The group with inter-leg BP difference of ≥ 12.5 mmHg had a longer hospital stay. [International Journal of Gerontology 2007; 1(4): 153–156]

**Key Words:** aortic dissection, hospital stay, inter-arm, inter-leg, systolic blood pressure difference

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**Introduction**

The essential feature of an aortic dissection is a tear in the intimal layer of the aorta, followed by formation and propagation of a subintimal hematoma. It is a medical emergency with a high mortality rate if appropriate management is not instituted immediately. There are two different systems classifying the aortic dissections. The Stanford classification divides dissections into two types: type A and type B. Type A involves the ascending aorta (DeBakey types I and II), whereas type B does not (DeBakey type III). Generally, this system also helps delineate treatment. Usually, type A dissections require surgery, while type B dissections may be managed medically under most conditions. The other classification is DeBakey classification, and it divides dissections into three types. Type I involves the ascending aorta, aortic arch, and descending aorta. Type II is confined to the
ascending aorta. Type III is confined to the descending aorta distal to the left subclavian artery. We attempted to estimate the differences in blood pressure (BP) between the inter-arm and inter-leg and compared the characteristics of the inter-limb systolic BP differences.

Materials and Methods

The Mackay Memorial Hospital in Taiwan is a 2,000-bed medical center that employs approximately 4,500 doctors, nurses and allied health professionals. The total number of annual visits to the emergency department (ED) by the patients is approximately 157,000. The clinical data of 168 aortic dissection patients diagnosed by the attending cardiologist and/or cardiovascular surgeons in this hospital from January 1999 to September 2005 were retrospectively reviewed.

Exclusion criteria were chronic aortic aneurysm with dissection and patients admitted because of other active problem with incidental detection of aortic aneurysm. Among the excluded, the clinical course was chronic, not acute, and aortic dissection was not the major problem. Patients without measurements of the systolic BP (SBP) of the four limbs on arrival were also excluded.

Inclusion criterion was patients presenting to the ED with aortic dissections identified on contrast-enhanced computerized tomography (CT) of the chest. Dissections must be acute, not chronic. All cases included in the study had BP of the four limbs on arrival at our ED. Single measurements of the SBP of the four limbs were taken noninvasively at the ED using the manometer. Data of patient number, DeBakey classification, age, mean SBP, presenting symptoms, mean hospital stay, and mortality were collected. We used SPSS version 11.5 for statistical analysis of data. Chi-squared test analysis was used for the comparison of inter-limb BP differences on arrival at our ED. A p value of less than 0.05 was considered to be significant.

Results

There were 30 males and 8 females whose ages ranged from 29 to 91 years, with a mean age of 58.7 ± 14 years. Of the 38 cases, 10 cases (26%) were Stanford type A and 28 (74%) type B. The SBP on arrival at our ED ranged from 86 to 264 mmHg, with a mean of 175 ± 43.3 mmHg (Figure). There were 27 hypertensive cases (71.1%; SBP > 140 mmHg). The SBP of the four limbs were 166.63 ± 35.96 mmHg for left arm, 163.97 ± 40.02 mmHg for right arm, 178 ± 47.23 mmHg for left leg, and 182.05 ± 52.04 mmHg for right leg. The inter-arm systolic BP difference (IASBPD) was 14.5 ± 15.7 mmHg, and the inter-leg difference was 12.5 ± 14.3 mmHg. Duration of hospital stay was 12.9 ± 11.8 days. The mortality rate was 3%.

The group with inter-arm BP difference of ≥ 14.5 mmHg had a lower SBP on arrival at the ED than the group with inter-arm BP difference of < 14.5 mmHg (164.9 ± 46.6 vs. 180.3 ± 41.6 mmHg; p = 0.004). The group with inter-leg BP difference of ≥ 12.5 mmHg had a longer hospital stay than the group with inter-leg BP difference of < 12.5 mmHg. (17.5 ± 17.5 vs. 10.2 ± 5.6 days; p = 0.004). For age and hospital stay, there was no obvious discrepancy between the inter-arm BP difference of ≥ 14.5 mmHg (p = 0.4) and < 14.5 mmHg (p = 0.077). For age and SBP on arrival at our ED, there was no significant difference between the inter-leg BP difference of ≥ 12.5 mmHg (p = 0.28) and < 12.5 mmHg (p = 0.113; Table).

Discussion

Aortic dissection is a medical emergency resulting from a tear in the intimal layer of the aorta, followed by formation and propagation of a subintimal hematoma. If it is not diagnosed early with aggressive resuscitation, a high mortality rate may result. Generally, it is more commonly seen in the male. Yu et al. reported a 6.5-year series analysis of a total of 5,654 aortic dissection cases with a male/female ratio of 2.2. In our study, the male/female ratio was 3.75, and aortic dissection usually occurs in the sixth and seventh decade of life (mean age in our study, 58.7 ± 14 years).

There are two different systems classifying the aortic dissections. The Stanford classification divides
Systolic blood pressure differences in aortic dissection involve the ascending aorta (DeBakey types I and II), whereas type B does not (DeBakey type III). This system also helps delineate treatment. Usually, type A dissections require surgery, while type B dissections may be managed medically under most conditions. The other classification is DeBakey classification, and it divides dissections into three types. Type I involves the ascending aorta, aortic arch, and descending aorta. Type II is confined to the ascending aorta. Type III is confined to the descending aorta distal to the left subclavian artery. About 70% of patients with aortic dissections were shown to have elevation of BP, and 49% of cases had elevated BP in thoracic aortic dissection. In our study, 71.1% of the 38 enrolled cases were hypertensive on arrival at our ED.

Typically, patients with acute aortic dissection complain of the sudden onset of severe and tearing chest pain. Armstrong et al. retrospectively studied 75 cases of aortic dissection and found that 41% of them had chest pain. In our study, 24 cases (63.2%) had symptoms of chest pain or chest tightness. Some patients had only mild pain, often mistaken for a symptom of myalgia or neuralgia located in the thorax, groin or back. Keeping a high clinical index of suspicion is important for the accurate and rapid diagnosis of aortic dissection.

In imaging studies, chest X-ray finding of a widened mediastinum was present in 62.6% of type A and 56% of type B dissections. CT or transesophageal echocardiography is the most commonly performed procedure for diagnosis. The average sensitivity of CT in the diagnosis of aortic dissection exceeds 95%, with specificity ranging from 87–100%.

It was shown that 31% of cases of thoracic aortic dissection had pulse deficits or BP differentials. Clinically, we anticipated that the IASBP and/or inter-leg SBP difference (ILSBPD) are clues to diagnosing aortic dissection; to our knowledge, ours is the first such study on the quantitative estimation of inter-limb SBP differences in the diagnosis of aortic dissection. In our study, the IASBP was 14.5±15.7 mmHg, and the ILSBP was 12.5±14.3 mmHg. Of the 38 enrolled cases, 23 cases (60.5%) had IASBP of ≥14.5 mmHg or ILSBP of ≥12.5 mmHg. In a group with hypertension but without aortic dissection, Arnett et al. reported a series of 2,395 hypertensive patients with a mean inter-arm diastolic and systolic BP differences of 2.96±2.51 and 4.61±4.10 mmHg, respectively. The IASBP was relatively lower in hypertensive cases than that in our study of aortic dissection cases (4.61 vs. 14.5 mmHg). Interestingly, Singer et al. analyzed 610 ED patients and found that the mean IASBP was significantly greater in patients with known coronary artery disease (Student’s t test; 14.5 vs. 10.4 mmHg; p=0.05). In our study, the estimated IASBP in aortic dissection cases of 14.5 mmHg was the same as a previous study of IASBP in known coronary artery disease cases.

Mendelson et al. analyzed 528 elderly and concluded that IASBPs of ≥10 mmHg were found in 14% of elderly patients and inter-arm diastolic BP differences of ≥10 mmHg in 5% of elderly patients. In another study of 237 family clinics visits, inter-arm SBP differences of >20 mmHg were found in 23% and inter-arm diastolic BP differences of >10 mmHg were found in 40% of cases. To our knowledge, our study is the first to measure the inter-limb SBP differences in aortic dissection cases.

In our study, the group with IASBP of ≥14.5 mmHg had a lower SBP on arrival at the ED than the group with IASBP of <14.5 mmHg (164.9±46.6 vs. 180.3±41.6 mmHg; p=0.004). The reasonable supposition is possibly the hemodynamic influence in cardiac output on occurrence of aortic dissection. So, the higher the IASBP, the lower the SBP on arrival at the ED.

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<th>Inter-arm and inter-leg blood pressure differences</th>
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<td>Systolic blood pressure difference</td>
<td>Inter-arm</td>
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<td>≥14.5 mmHg</td>
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<td>Systolic blood pressure on arrival at emergency department (mmHg)</td>
<td>164.9±46.6</td>
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<td>Age (yr)</td>
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<td>Hospital stay (d)</td>
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*p<0.05.
other hand, the higher the ILSBPD, the longer the hospital stay (17.5 ± 17.5 vs. 10.2 ± 5.6 days; \( p = 0.004 \)). We presume the higher the ILSBPD, the more seriously morbid the aortic dissection and a greater need for a longer hospital stay. For age, there was no significant discrepancy between the higher and lower differences in inter-limb SBP.

In conclusion, with retrospective study of aortic dissection, we found that the IASBPĐ was 14.5 ± 15.7 mmHg and the ILSBPĐ was 12.5 ± 14.3 mmHg. Inter-limb SBP differences are helpful clues in the diagnosis of aortic dissection. The IASBPĐ plays an important role in the SBP on arrival at the ED. A lower SBP on arrival to the ED was found in the group with IASBPĐ of \( \geq 14.5 \) mmHg. On the other hand, the ILSBPĐ affects the hospital stay mainly. The higher the ILSBPĐ, the greater the need for a longer hospital stay. In the future, the measurement of sensitivity and specificity of IASBPĐ 14.5 mmHg and ILSBPĐ 12.5 mmHg is expected in diagnosing aortic dissection.

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References