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Serum Creatine Kinase in Tubal and Normal Pregnancy

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ABSTRACT

Objective To compare the serum creatine kinase level between tubal pregnancy and normal pregnancy.

Design Cross-sectional study.

Setting Department of Obstetrics and Gynaecology, and Central Laboratory, Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University.

Subjects and methods One hundred and forty-six pregnant women who had no history of cardiac disease or muscular disease or injury attending the Obstetrics and Gynaecology Department between 1st July 1994 and 30th June 1995 were recruited in this study. They were classified into two groups as fifty-five women with tubal pregnancy and ninety-one normal pregnant women. Serum creatine kinase of all subjects were measured by Rosalki's method before any procedures or treatments.

Main outcome measures Mean and standard deviation of serum creatine kinase.

Results The mean (± standard deviation) in tubal pregnancy group was significantly higher than in normal pregnancy group (64.47 ± 35.62 and 43.40 ± 12.36 IU/L respectively, P = 0.000).

Conclusion There was a significant difference in the mean serum creatine kinase between tubal and normal pregnancy. This finding indicates that the measurement of serum creatine kinase level may be useful for early diagnosis of tubal pregnancy.

Key words : creatine kinase, tubal pregnancy, normal pregnancy

Ectopic pregnancy has been having an increasing impact upon the lives of women and their families around the world.[1] Ectopic pregnancy emerges as a leading cause of maternal mortality, despite a declining death-to-case rate. The consequences of an ectopic pregnancy can be devastating to the reproductive potential of the woman, causing as much as 50 % decrease in fertility.[2] Early detection of ectopic pregnancy before tubal rupture and haemorrhage presents a diagnostic challenge to the clinicians. Although the final diagnosis has been greatly aided by advances in biochemical monitoring of human chorionic gonadotropin (hCG) and by recent improvement in high-resolution transvaginal ultrasound. A diagnostic grey area exists where pelvic ultrasonography is normal, despite elevated hCG levels. At present, such diagnostic difficulties are resolved by serial hCG estimation or diagnostic laparoscopy, with the result that diagnosis may be delayed or that patients may be exposed to unnecessary operative risk. Several attempts have been made for biochemical tests to improve the diagnosis of ectopic pregnancy.

Since the fallopian tube lacks a submucosal layer, the ectopic trophoblast quickly penetrates and damages the smooth muscle layer.[3] Creatine kinase is released from damaged muscle cells into the circulation. The preliminary study[4] showed that serum creatine kinase levels were significantly higher in all patients with tubal pregnancies when compared to patients who had intrauterine pregnancies. This study was conducted to compare the serum creatine kinase level between tubal pregnancy and normal pregnancy in Thai women.

Materials and Methods

Plasma was collected from all patients who were admitted to Maharaj Nakorn Chiang Mai Hospital with suspected tubal pregnancy between 1st July 1994 and 30th June 1995. The samples were collected on the day of first presentation, after initial clinical assessment but before any operative intervention. Definite diagnosis of tubal pregnancy was made by operative or laparoscopic and/or histological findings. The serum creatine kinase levels of the study group were compared to normal pregnant women seen at a comparable gestational age, determined by menstrual dates and confirmatory pelvic examination or ultrasonography, at the antenatal care clinic. Exclusion criteria included potentially confounding variables that could cause increased serum creatine kinase irrespective of pregnancy location and trauma, known muscle injury, receiving intramuscular injections, hypovolemia requiring blood transfusion, and new or past heart disease.

Total serum creatine kinase level was measured on Altaire discreting automated chemical analyzer (Electro-nucleonics, Inc.) using CK_{LTS} reagent (Schiapparelli Biosystems, Inc.), Rosalki's method. Means of the serum creatine kinase levels were compared in patients with tubal pregnancies versus normal pregnancies. Student's t-test was used to compare the creatine kinase levels between both groups.

Results

A total of 146 patients were enrolled in this study. Fifty-five patients (37.7%) were tubal pregnancies, and ninety-one patients (62.3%) were normal pregnancies. The ages were 28.27 ± 5.45 and 28.03 ± 5.55 years for the tubal pregnancy and normal pregnancy groups, respectively. There was no difference in the mean ages, t-test, P = 0.799. The mean gestational age was 6.64 ± 3.26 and 9.95 ± 2.39 weeks for the tubal pregnancy and normal

pregnancy groups, respectively. The mean gestational age in normal group were significantly higher than in the tubal pregnancy group, P < 0.001.

The mean creatine kinase level in patients with tubal pregnancies was 64.47 ± 35.62 (range, 21-188) IU/L, significantly higher than normal pregnancies (43.40 ± 12.36 ; range, 14-70 IU/L), P = 0.000. The individual creatine kinase levels in both groups are shown in Fig. 1.

Of the fifty-five tubal pregnancies, thirty-three (56.4%) were non-ruptured tubal pregnancies and twenty-four (43.6%) were ruptured tubal pregnancy. The means creatine kinase levels in both subgroups were not significantly different, 64.10 ± 28.22 and 61.08 ± 43.80 IU/L (P =

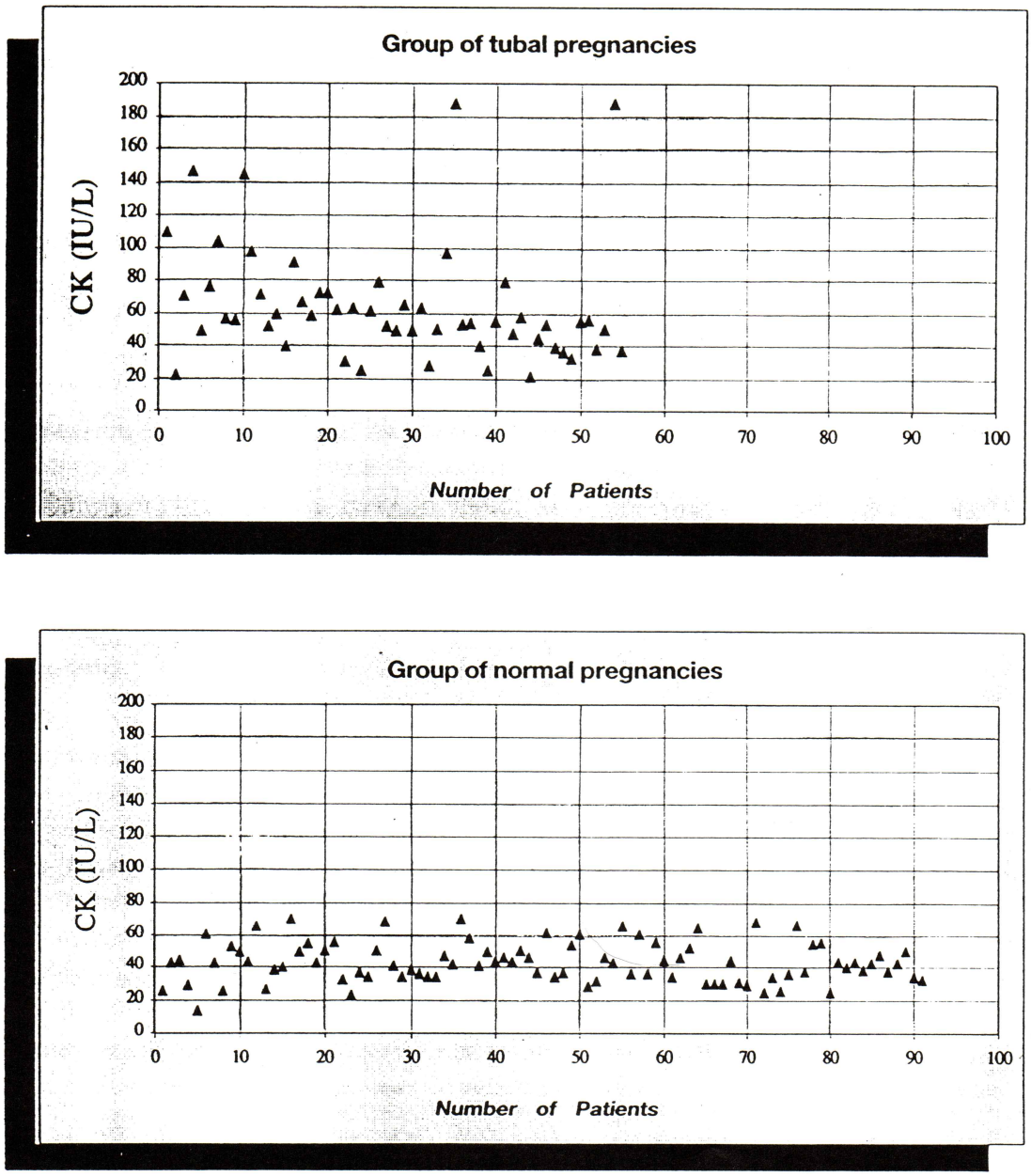

Fig. 1. Scatter diagram of the serum creatine kinase levels.

0.562) for the non-ruptured tubal pregnancy and the ruptured tubal pregnancy subgroups respectively.

Discussion

This study found that the mean serum creatine kinase levels in tubal pregnancy group was significantly higher than in normal pregnancy group. The serum creatine kinase levels may be an additional diagnostic tool in early diagnosis of tubal pregnancy especially in cases where history and clinical examination are unclear. A rise in serum creatine kinase level is natural in tubal gestation because the zygote penetrates the tubal epithelium and lies adjacent to the muscle layer, which lacks a submucosal layer. Due to invasion of the muscle layer by trophoblasts, the maternal blood vessels are eroded and blood leaks through the growing trophoblasts and damaged muscle layer causing a rise in muscle cell products such as creatine kinase.[4,5]

The result of this study supports the recently published findings that suggested that serum creatine kinase level can predict tubal pregnancy. Lavie O et al[4] found that creatine kinase level in all patients with tubal pregnancy was significantly higher than the level in spontaneous abortion and normal pregnancy. Chandra L and Jain A[5] also found that creatine kinase levels in all patients with tubal pregnancies was significantly higher than in the missed abortion, pelvic inflammatory disease, and acute appendicitis. The pathology in missed abortion and pelvic inflammatory disease is different from tubal pregnancies and there is no rise in serum creatine kinase as demonstrated by Chandra L and Jain A. Despite appendix contains a smooth muscle layer, but serum creatine kinase is not raised in appendicitis for unknown reason.

Lavie O et al[4] suggested that patients with a maternal serum creatine kinase level ≥ 45 IU/L had a high probability for tubal pregnancy, while Chandra L and Jain A[5] suggested a level of ≥ 75 IU/L. Dancan WC et al[6] found higher creatine kinase levels in patients with ectopic pregnancy but significant overlaps existed in the values from the ongoing pregnancy, complete miscarriage and incomplete miscarriage groups. Using a cut-off point of 45 IU/L, Duncan WC found that the maternal plasma creatine kinase activity lacked the sensitivity and specificity to be of clinical value in the diagnosis of tubal pregnancy. Qasim SM et al[7] found that there were no significant differences in mean total creatine kinase levels for patients with ectopic pregnancy versus normal pregnancy or abnormal intrauterine pregnancy (nonviable or blighted ovum).

In this study the mean gestational age in normal pregnancy group was significantly higher than that of the tubal pregnancy group, but Duncan WC et al[6] found that there was no evidence of a clinically significant relation between creatine kinase and gestation. We therefore conclude that there was a significant difference in the mean serum creatine kinase between tubal and normal pregnancy. The value of creatine kinase as an early clinical marker for tubal pregnancy and cut-off level should be further evaluated.

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References

1. Dorfman SF. Epidemiology of ectopic pregnancy. Clin Obstet Gynecol 1987 ; 30 : 173-80.
2. Russell JB. The etiology of ectopic pregnancy. Clin Obstet Gynecol 1987 ; 30 : 181-90.
3. Budonick M, Johnson TRBJr, Genardy R, Parmley TH, Woodruff JD. The histopathology of the developing tubal ectopic pregnancy. Fertil Steril 1980 ; 34 : 169-71.
4. Lavie O, Beller U, Neuman M, Ben-Chetrit A, Gottcshalk-Sabag S, Diamant YZ. Maternal serum creatine kinase : A possible predictor of tubal pregnancy. Am J Obstet Gynecol 1993 ; 169 : 1149-50.
5. Chandra L, Jain A. Maternal serum creatine kinase as a biochemical marker of tubal pregnancy. Int J Gynecol Obstet 1995 ; 49 : 21-3.
6. Duncan WC, Sweeting VM, Cawood P, Illingworth PJ. Measurement of creatine kinase activity and diagnosis of ectopic pregnancy. Br J Obstet Gynaecol 1995 ; 102 : 233-7.
7. Qasim SM, Trias A, Sachdev R, Kemmann E. Evaluation of serum creatine kinase levels in ectopic pregnancy. Fertil Steril 1996 ; 65 : 443-5.