

## Plasma and Urinary Ascorbic Acid Levels in the Postoperative Period

Ascorbic acid is specifically required in the synthesis of collagen, besides its various other roles in metabolism<sup>1,2</sup>. It is known that in scorbutic condition the healing process is delayed<sup>3,4</sup>, which may be due to the inability of the scorbutic animal to produce the intercellular substance of the connective tissue. This is substantiated by the finding that ascorbic acid is required for the maintenance of collagen<sup>5</sup>. Further, the collagen synthesis is enhanced by the administration of ascorbic acid in scorbutic guinea-pigs<sup>6-8</sup>. However, the exact mechanism of its involvement in this step is not known.

We report here the levels of plasma and urinary ascorbic acid after administering 500 mg of vitamin C to patients undergoing abdominal surgery to see whether the rate of its utilization may be used as a measure of collagen synthesis in the postoperative period.

Ten female patients of an age of 28-35 years undergoing abdominal surgery were selected for the present study. Before the operation 24 h urine was collected and 5 ml of blood was withdrawn; and the ascorbic acid level in both blood-plasma and urine was estimated colorimetrically according to the method of ROE<sup>9</sup> using 2,4-dinitrophenylhydrazine. Each patient, after the surgery, was then administered 500 mg of vitamin C daily starting from the 1st up to the 9th postoperative day and the levels of plasma and urinary ascorbic acid were determined<sup>9</sup> at 3rd, 6th and 9th postoperative days. The concentration in each sample was obtained from a standard curve which was prepared each time and was linear. The data were expressed as mg ascorbic acid/100 ml plasma and mg ascorbic acid/24 h of urine. Care was taken not to supplement the diet of these patients with any fruits of the citrus family during the period of this study. Original values (Table) for plasma and urine are within the range as described for normal people by HARPER<sup>10</sup>.

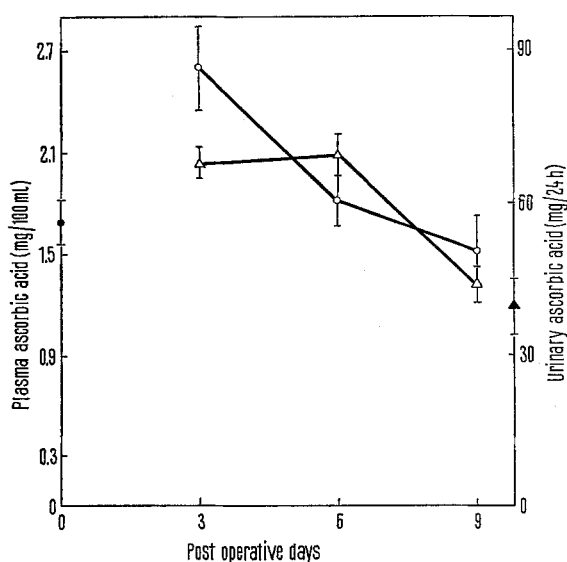
Ascorbic acid level of plasma in postoperative period decreased sharply between the 3rd and 6th day followed by no significant change till the 9th day (Figure). Level of urinary excretion of ascorbic acid, unlike that of

plasma, remained almost unchanged between the 3rd and 6th day and then declined significantly. The values for urinary ascorbic acid on the 9th day were the same as those obtained for control subjects (Table and Figure). It is worth noting that even though 500 mg of vitamin C was administered daily to these patients, there was a fall in plasma concentration in the early period of wound healing. The plasma level then remained constant and approached the original value.

Thus, the relationship between plasma and urinary level of ascorbic acid is strongly suggestive of the rapid utilization of this vitamin in the postoperative period presumably for the synthesis of collagen at the site of the wound. It may be concluded that administration of vitamin C in the postoperative period may lead to a quicker healing as ascorbic acid enhances the proline hydroxylase dependent conversion of proline to hydroxyproline for the synthesis of newly forming collagen in the vicinity of the wound<sup>11,12</sup>.

Plasma and urinary ascorbic acid levels in normal individuals

No.	Plasma ascorbic acid level (mg/100 ml)	Urinary ascorbic acid level (mg/24 h)
1	1.10	33.99
2	2.05	45.21
3	1.50	40.12
4	1.30	37.00
5	1.70	42.20
6	1.90	33.99
7	1.30	42.20
8	1.55	45.21
9	2.65	36.09
10	1.85	40.03
Average	1.69	39.60
S.D.	0.434	3.98
S.E.	0.137	1.25



Plasma (○) and urinary (△) ascorbic acid levels (mean  $\pm$  S.E.M.) of 10 postoperative patients. ●, plasma and ▲, urinary ascorbic acid concentrations of the same cases before operation.

**Zusammenfassung.** Der Plasma- und der Urin-Ascorbinsäurespiegel wurden während der postoperativen Periode nach täglicher Zufuhr von 500 mg Vitamin C bei Patienten kolorimetrisch gemessen. Der schnelle Verbrauch des Vitamins macht einen Ascorbinsäurebedarf zur Kollagensynthese am Ort der Wunde wahrscheinlich.

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