Circadian pattern in occurrence of renal colic in an emergency department: analysis of patients' notes

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According to anecdotal evidence people are more at risk of renal colic during the night. Although this has never been investigated, several studies have shown a circadian variation for other acute diseases.¹ We investigated whether renal colic occurred in a circadian pattern.

Methods and results

We reviewed all episodes of renal colic from 1 January 1990 to 31 December 1996 in the emergency department of St Anna Hospital, which serves the 150 000 people in the city and suburbs of Ferrara, Italy. Altogether 3410 episodes of renal colic were reported (66.0% (2281) in men). The mean age of the patients was 46 years (SD 16 years). The time (within 30 minutes) when symptoms started could be determined for 3360 (98.5%) patients (2272 men and 1088 women). All patients were physically examined and had radiological, ultrasound, urine, and blood tests. Kidney stones were found in 1641 patients (48.8%; 1134 men and 507 women), of which 71.0% (1165) were calcium stones. For the main statistical analysis of the 3360 patients for whom time of onset could be determined precisely, we used a partial Fourier series with up to four harmonics (24, 12, 8, 6 hours), categorising each precise time of event as one of 24 increments of one hour. To test goodness of fit we calculated the "percentage of rhythm," the percentage of overall variability of data about the arithmetic mean attributable to the fitted rhythmic function. We used the F test to determine the significance of the fit of each function.

The 50 patients for whom the onset time of the episode of renal colic could not be determined precisely had the same confounding factors as the other 3360—age, sex, race, and underlying condition of nephrolithiasis. A secondary analysis including these 50 patients showed that excluding them from the main analysis did not significantly affect the results.

A highly significant ($P < 0.001$) circadian rhythm was found, with a morning peak and an afternoon low (figure) both in the population as a whole (overall peak 0432 hours (95% confidence interval 0320 to 0556), percentage of rhythm 62.8%), and in subgroups by sex (men: $n=2272$, 0456 (0328 to 0624), 56.6%; women: $n=1088$, 0411 (0300 to 0520), 66.7%). Participants with or without kidney stones did not differ ($n=1641$, 0448 (0315 to 0550), 59.2%; $n=1719$, 0424 (0305 to 0535), 64.4%, respectively).

Comment

Episodes of renal colic show a significant circadian pattern, with a morning peak and a minimum in the afternoon. Urine production and renal excretion rates of solutes rise during daytime and reach minimum values

Episodes of renal colic in 3360 patients at different times of day

at night. In healthy people, the glomerular filtration rate shows a circadian rhythm peaking in the morning, with a relative amplitude of 33%.² This rhythm means that urine is hyperconcentrated during night time, which entails a risk of nephrolithiasis and infections. The lithogenic risk for calcium oxalate stones is highest at the end of the night or during the early morning, when urinary output is minimal.³ Studies on healthy people and people who have had kidney stones showed a higher risk of calcium oxalate crystallisation in the morning.⁴ The inhibitory activity of calcium oxalate crystallisation showed a marked circadian rhythm in both groups, but in people who had had kidney stones the peak time was delayed (0900-1000 v 0500-0600). A circadian variation with a midnight peak, independent of meal times, has been reported for episodes of biliary colic.⁵

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