CASE REPORT

Delayed massive haemothorax 10 days following percutaneous nephrolithotomy

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SUMMARY

A 56-year-old man presented with massive right haemothorax 10 days following percutaneous nephrolithotomy (PCNL) for complex, large-bulk, right renal stones. Antiplatelet medication started following coronary stenting 7 months ago was stopped 5 days prior and resumed 2 days following surgery. Stones were cleared through two tracts, one supracostal, with placement of ureteral stent but no nephrostomy. He was discharged the next day with an unremarkable chest X-ray. He developed cough and fever after 1 week. Three days later he presented with acute dyspnoea, blood pressure of 100/60 mm Hg, pulse of 120/min and haemoglobin of 9.0 g/dL. Chest X-ray and CT scan showed a large right haemothorax. Two-litre haemothorax was drained by intercostal drainage with prompt recovery. Haemothorax is a rare complication following PCNL usually after supracostal access. Most occur at or immediately following surgery. Infection and early resumption of antiplatelet medication might have contributed to his presentation with delayed secondary haemorrhage from a pleural injury.

BACKGROUND

Haemothorax is a rare but well-documented complication following percutaneous nephrolithotomy (PCNL).¹ It almost invariably occurs at or immediately following the surgical procedure as a consequence of pleural injury.² Haemothorax occurring after 10 days as it occurred in our patient is exceedingly rare and is likely to have had a somewhat different pathogenesis. It is our contention that such haemorrhage after 10 days should be

regarded as a form of delayed secondary haemorrhage from a pleural injury triggered by infection and exacerbated by early resumption of double antiplatelet medication. A study of this case can be quite instructive for the urologist who undertakes interventions for stone disease.

CASE PRESENTATION

A 56-year-old man presented with delayed massive haemothorax 10 days after PCNL carried out through two tracts, one of which was supracostal.

Complex right renal stone disease was diagnosed in the patient when he presented to the hospital 7 months prior to PCNL with acute coronary vascular disease. He underwent coronary angioplasty with placement of a drug-eluting coronary stent and was initiated on clopidogrel and aspirin.

In planning an elective PCNL, these drugs were stopped 5 days prior to surgery in consultation with the treating cardiologist. He was noted to be hypertensive but not diabetic and had no prior pulmonary problems. His bleeding time (3.2 min), clotting time (3 min), Prothrombin time international normalized ratio (1.1) and activated partial thromboplastin time (32 s, control 34 s) were normal at admission. Other preoperative investigations were as follows: serum creatinine 1.0 mg/dL, haemoglobin 14.6 g/dL, total leucocyte count $9.6 \times 10^9/L$, random glucose 100 mg/dL, sodium 140 meq/L and potassium 3.8 meq/L. Urine showed pyuria but the culture was sterile. Chest X-ray was normal. He was empirically treated with oral cefixime 200 mg twice daily for 5 days prior to admission.

CT scan showed large-bulk stones, the largest being 6.5 cm $\times$ 2.2 cm $\times$ 2.4 cm with multiple calyceal fragments (figure 1A,B). The large stone was straddling a bifid pelvis, with half of the bulk in the superior part of the collecting system, which was dilated. There were multiple calyceal stones in the inferior part of the system that measured 1.5 cm, 1.2 cm and 1.0 cm, as well as additional debris.

The surgical plan was for a standard PCNL via the inferior part of the collecting system using an 18F access sheath, reserving the possible need for a superior access depending on intraoperative progress. PCNL was carried out in the prone position using fluoroscopic guidance and a 'bull's-eye' technique through the posterior inferior calyx. A combination of pneumolithotripsy and holmium laser lithotripsy was used to clear the stones. The inferior part of the collecting system and part of the main stone could be cleared, but a significant part of the bulk could not be accessed via this tract,

Figure 1 CT scan of the right kidney showing complex right renal stones with a large pelvic stone about 6 cm (A) as well as multiple right stones in the inferior part of the collecting system (B). RT; right.

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Figure 2 Chest X-ray done immediately following surgery showing minimal pleural reaction on the right side. He had no symptoms at this time.

necessitating a superior calyceal puncture. The shortest and most effective route took the tract via the 11th intercostal space. The procedure proceeded uneventfully with complete clearance of stones in 80 min. A double J stent but no nephrostomy was placed. He made a satisfactory recovery from anaesthesia and was kept under observation for 1 day. A chest X-ray done following surgery was satisfactory and he was discharged on the next morning (figure 2).

His antiplatelet drugs were resumed on day 2 postoperatively. Seven days after surgery he developed cough and a low-grade fever. Three days later he developed shortness of breath and attended the emergency. He was noted to be tachypnoeic (respiratory rate 36 per min) with absent breath sounds on the right side. His blood pressure was 100/60 mm Hg, pulse rate was 120/min and he had 33.7 degree Celsius fever.

INVESTIGATIONS

Chest X-ray (figure 3) and subsequent CT scan (figure 4) confirmed a large right pleural collection. His haemoglobin which was 13.0 g/dL at discharge was now noted to be 9.0 g/dL.

Figure 3 Chest X-ray done on day 10 when he presented with shortness of breath to the emergency.

Figure 4 CT scan of the chest showing fluid in the pleural space with collapse of the right lower and middle lobes.

His arterial oxygen saturation was 82%. Total leucocytes were $13.6 \times 10^9/L$.

DIFFERENTIAL DIAGNOSIS

In view of the recent surgery under general anaesthesia and his presentation with cough and fever, a possibility of pneumonia or atelectasis with infection was considered. However, the clinical presentation was strongly suggestive of haemothorax.

TREATMENT

An emergency right intercostal drainage tube was placed under local anaesthesia using ultrasonography guidance by standard technique. Over 48 hours 2.1 L of haemothorax was drained with improved expansion of the right lower and middle lobes (figure 5). Drain fluid creatinine was noted to be 0.9 mg/dL consistent with haemothorax rather than urine admixed with blood. There was no further drainage after 48 hours and the chest tube was removed. The patient made a prompt clinical recovery.

OUTCOME AND FOLLOW-UP

Follow-up evaluation showed satisfactory expansion of the right lung with complete resolution of all chest symptoms (figure 6). Plain X-ray of the kidney-ureter-bladder regions KUB showed complete clearance of stones (figure 7). His antiplatelet drugs were resumed 1 week after removal of the chest tube. Further recovery proceeded uneventfully after discharge and he is doing well at 2 months.

DISCUSSION

Haemothorax is a very rare complication following PCNL. The Clinical Research Office of the Endourological Society (CROES) global PCNL study of 4494 patients did not find a single instance of haemothorax,¹ while Mousavi-Bahar *et al*² found just two instances of haemothorax in a series of 671 patients (0.3%).

All pulmonary complications including haemothorax are more common when the collecting system is accessed via the superior calyx with inadvertent injury to the pleura or rarely the lung,¹ but haemothorax has also been described following a subcostal mid-polar access.³ Superior calyceal tract may be preferred in situations when the stone is in that calyx or when that tract gives

Figure 5 Good expansion of the right lung seen on first day following drainage of the haemothorax.

the best pelvic or upper ureteric access with minimal torque. Superior calyceal tracts usually, although not always, necessitate a puncture above the 12th rib, potentially endangering the pleura. Tracts above the 12th rib are transthoracic but might be extrapleural especially if placed lateral to the midpoint of the 12th rib. Tracts above the 11th rib are invariably transthoracic as well as transpleural.

Pulmonary complications can be minimised at PCNL by avoiding a supracostal puncture where possible often with the judicious use of flexible instrumentation. When necessary, coordinating the puncture with respiration, using an access sheath, ensuring that the sheath remains within the system throughout the procedure, and leaving a double J stent at the end of the procedure can all help reduce pulmonary complications.³

In establishing access to the superior calyx, the segment of the tract through the retroperitoneum and diaphragm is established during expiration to allow the lung and pleura to move up and away from danger. However the final entry into the kidney is made during inspiration to allow the kidney to descend.⁴ This last step reduces the odds of requiring a puncture above the 11th

Figure 6 Follow-up chest X-ray done 2 weeks after discharge.

Figure 7 X-ray Kidney-Ureter-Bladder showing clearance of stone and double J stent in position.

rib and may enable one to 'get away' with a subcostal access on occasion.

Most supracostal tracts heal uneventfully, attested to by the relatively low rate of complications in most contemporary series.¹ Rarely pulmonary complications such as hydrothorax or haemothorax may follow.

Pulmonary complications are most often identified in the operating room at the time of extubation or in the immediate postoperative period. While rare instances of delayed presentation of other pulmonary complications such as a nephropleural fistula have been noted,⁵ the authors could not find any report in the literature of a delayed haemothorax following PCNL.

The most common pulmonary complication directly attributable to PCNL surgery is hydrothorax.¹ Hydrothorax and haemothorax share some similarities in their aetiopathogenesis, but there are important differences. Hydrothorax requires transgression of the pleural cavity along with a communication between the collecting system and the pleura. This communication may be a transient intraoperative one, for instance, due to the displacement of an access sheath or failure to use one. It could also be a postoperative fistulous communication established as a consequence of the initial transgression. In contrast haemothorax requires only transgression of the pleura.

The subsequent mechanism of bleeding could be either primary haemorrhage, in which case the patient would present immediately, or a delayed secondary haemorrhage that could be triggered by infection. In our patient, chest infection and cough might have reopened an initial injury and the bleeding was possibly exacerbated by the antiplatelet medication.

Imaging evaluation to exclude pleuropulmonary complications has been recommended following PCNL whenever a supracostal tract is established above the 12th rib. This can

be by intraoperative chest fluoroscopic imaging, postoperative chest X-ray or by a non-contrast thin-cut CT scan. A study that examined these three techniques found that intraoperative fluoroscopic imaging identified most clinically relevant injuries, but that one needs to combine imaging with a high index of clinical suspicion to identify all patients needing intervention.⁶ Lack of a supracostal tract must not breed complacency.

Antiplatelet medication might have played a role in the development of haemothorax. The American Urological Association recommends that oral antiplatelet medication be discontinued prior to an elective PCNL with resumption being a multidisciplinary decision depending on risk stratification.⁷ Our patient was taken off the antiplatelet drugs 5 days prior to surgery with resumption 2 days after surgery under careful supervision of the

treating cardiologist. In contrast, the CROES group stopped antiplatelet drugs 10 days before and resumed them 5 days after surgery.⁷ It is possible that a delay in resumption of antiplatelet medication might have avoided haemothorax in our patient.

Contributors SS (lead author), planning, concept, design, case material collection, analysis, reporting, interpretation, revision, final approval, accountable for integrity and overall responsibility. RGB (coauthor): planning, case material collection, interpretation, revision, final approval, accountable for integrity, overall responsibility. MSR (coauthor): case material collection, interpretation, revision, final approval, accountable for integrity, overall responsibility.

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Learning points

- ▶ Haemothorax can present several days following percutaneous nephrolithotomy.
- ▶ Supracostal puncture is associated with a higher risk of haemothorax, but lack of a supracostal access does not preclude haemothorax.
- ▶ Antiplatelet medication may render patients more vulnerable to delayed haemothorax.
- ▶ Infection might play an undetermined role in this (presumed) secondary haemorrhage into the pleural space.
- ▶ Patients taking antiplatelet medication undergoing percutaneous nephrolithotomy should be followed carefully for at least 2 weeks for the development of chest complications.

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