

Bleeding In The Spinal Medulla And Cervical And Thoracic Spine Fractures After Minor Trauma: A Case Report

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Abstract

HISTORY OF PRESENT ILLNESS:

A male patient born 1936 suffered a minor injury during his vacation in southern Italy falling after having suffered from sudden vertigo. His fall was observed by his wife who immediately helped him standing up. In the following hours he complained of increasing severe left side shoulder pain and was admitted to a regional general hospital.

X-Rays excluded fractures of the shoulder and diagnosis of left shoulder contusion and stable fracture of the spinous processus C7 was made.

The MRT showed a hyperdense area in the cervical spine C3-6 which was viewed as not significant.

During the following 24 hours after trauma the patient's left arm showed grotesque swelling and thrombosis of the left subclavian vein was suspected but could not be confirmed sonographically. The swelling was interpreted as a huge hematoma after shoulder contusion by the local physicians.

As the patient's diuresis decreased an intravenous therapy with 1000ml of physiologic saline per day was started.

Laboratory findings 24 hours after trauma showed an abnormal high creatinine of 4 mg/dl (normal range 0.6-1.5mg/dl), a abnormal low hemoglobin of 9 g/dl. The rest of the blood chemistry and coagulation findings were normal.

At that point following diagnosis were made by the local doctors:

1. Stable fracture of spinous processus C7 without neurological deficit
2. Left shoulder contusion and hematoma of left

shoulder region

3. Beginning renal failure (pre-renal aetiology suspected)

MEDICAL TREATMENT

The patient recieved the following treatment:

- dexamethasone 12 mg/24 hours intravenously
- low molecular weight heparin (nadroparin)
- physiologic saline infusions
- cefotaxime and ranitidine

Swiss Air-Ambulance were asked by the patient's family to organize a transport back to Switzerland as they were very concerned by the rapidly worsening condition of the patient.

The local attending physician declared the patient as being absolutely stable from a medical point of view. He stated that dialysis would eventually be initiated before transportation.

He informed the responsible flying doctor about the above mentioned diagnoses and treatment. The results of the MRT was not reported to Swiss Air-Ambulance's physician.

PREFLIGHT ASSESSEMENT

The patient was reported to have been totally healthy before the sustained accident and as stable at the time of transport both by the family and the treating physician in Italy.

Therefore only standard preparations before flight were taken. The transport was organised with a dedicated air-ambulance.

MEDIAL FINDINGS IN THE GENERAL HOSPITAL IN ITALY

The flight to Naples with the Challenger 604 took two hours and an additional three hours ride by road ambulance to reach the hospital.

The medical staff from Swiss Air-Ambulance first examined the patient at 36 hours after sustained trauma.

Medical findings at that time were the following:

Moribund patient with:

1. Incomplete quadriplegia
2. Acute Compartment Syndrome of left upper extremity
3. Acute anuric renal failure
4. High clinical suspicion of thrombosis of left subclavian vein (sonographically not confirmed)
5. Non Insulin Dependent Diabetes Mellitus

A dialysis had not been performed and the patient was anuric.

Further medical treatment and especially the emergency treatment of the compartment syndrome of the left arm was refused by the local medical staff.

Only by chance the medical team of Swiss Air-Ambulance was informed about the MRT-findings. The suspected bleeding of the cervical spinal medulla as well the acute renal failure were still denied being a serious problem by the local doctor.

Because of insufficient medical treatment and denial of emergency medical treatment in the local hospital, the Air-Ambulance team decided to fly the patient to Switzerland immediately. (The risk of leaving him in this hospital was regarded as higher as the risk of transport.)

In order to avoid the long ambulance ride and to reduce the time to emergency operation of the acute compartment syndrome of the left arm the Operations Center of Swiss Air-Ambulance organized the transfer of the patient by helicopter back to Naples. This flight took 40 minutes and from there it took another 2 hours flight by air-ambulance to Zurich. Here a road ambulance waited for the patient and took him to the University Hospital of Zurich.

FLIGHT SUMMARY

During the entire flight the patient remained hemodynamically stable with systolic pressures between 110 and 130 mmHg under continuous intravenous normal saline infusion. He was tachypnoic with a RR of 20-25. Oxygen saturation (under 7 Liters of oxygen/minute) was 95-98 %. Spine Protection was maintained during the whole flight with a C-collar and spine board.

FINDINGS IN UNIVERSITY HOSPITAL OF ZURICH

The patient's initial venous blood gas analysis showed respiratory compensation of metabolic lactate acidosis and as a sign of underlying compartment syndrome highly elevated CPK and myoglobin values:

Figure 1

pH 7.3, pCO₂ 2.2 kPa, pO₂ 8.3 kPa (with 6 liters oxygen by nasal cannula), SvO₂ 91 %, HCO₃⁻ 8.2 mmol/l, BE -16 mmol/l, lactate 19.7 mmol/l, Na⁺ 132 mmol/l, K⁺ 2.8 mmol/l, HCT 18 %, Crea 307 mmol/l (upper normal value 105 mmol/l), Urea 31 mmol/l (12), CPK 44'000 U/l (190), myoglobine 22'000 µg/l (72), normal coagulation parameters.

The X-rays were repeated and showed the known stable fracture of spinous process of C7 but also unstable fractures of T 4, 6, 7, and a stable fracture of T 5 as well as a left side pleural effusion.

THERAPY

Due to the acute compartment syndrome an emergency intervention (fasciotomy) of the left arm was done immediately.

Hemodialysis (CVVHDF) was performed while potassium was rising up to 6 mmol/l due to crush induced acute renal failure.

A therapy with unfractionated heparin was started until subclavian vein thrombosis could be definitely ruled out.

PROGRESS

Further medical investigation showed that since 1997 the patient was known suffering from hypertensive dilatative cardiomyopathy with an LVEF of 34%, pulmonary hypertension (dP 35mmHg) and that he had suffered from left heart failure in the past and was treated with enalapril, hydrochlorothiazide and furosemide.

The patient also was known having had an operation in the past with decompression and spondylolysis of L4/S1 due to

cauda equina syndrome and since suffered from neurogenic bladder dysfunction with vesico-urethral reflux. During this operation the patient developed a tachycardic atrial fibrillation with hemodynamic consequences.

In 1998 a resection of the lower part of the left lung was performed because of a hamartoma.

He also was known having suffered a cerebrovascular infarction with known hemisindrome on left side and since treated with aspirin and oral anticoagulation.

Diabetes was known for several years and treated with oral antidiabetics (metformin and glimepiride).

Finally, due to a chronic acid indigestion with reflux esophagitis a therapy with omeprazol was maintained.

To verify the cause of the acute neurological deficits the MRT should have been re-evaluated but it was refused by the Italian physicians to hand over the pictures and the examination could not be repeated in Zurich because of the very serious status of the patient.

In the following days a total of seven operations (debridements) due to the compartment syndrome became necessary.

On day seven after admission the patient developed acute hematemesis due to reflux esophagitis and the administration several blood transfusions became necessary.

Three days later, on day ten, an occlusion of the right radial artery where the arterial line was placed was diagnosed and a therapy with iloprost (a synthetic prostaglanine analogue) was started.

On day eleven after admission platelets fell below $65'000/\mu\text{l}$ (under substitution of thrombocytes) and a heparin induced thrombocytopenia (HIT) II with high antibody levels was diagnosed. Heparin was immediately stopped and a therapy with the lepirudin started.

Six days later multiple occlusions of both jugular and subclavian veins were diagnosed and on day 21 after admission the patient was now also septic and developing concomitant severe hemothorax under fulminant HIT II-died.

DISCUSSION

After sustaining minor trauma the patient who was under medical treatment with ASA and oral anticoagulation

developed bleeding in spinal cord with neurological deficits.

During the first 36 hours after trauma he developed an acute compartment syndrome of the left upper extremity supposedly due to immobilization and improper positioning of the arm in the receiving hospital. As thrombosis of subclavian vein was suspected a treatment with low molecular weight heparin was installed.

This therapy with heparin was continued in Switzerland until subclavian vein thrombosis could be excluded.

12 days after treatment with heparin the patient showed a fall of platelets and the diagnosis of HIT II was made.

Unfortunately the patient did not survive the serious bleeding complications even under treatment with lepirudin and substitution of platelets.

We regard the following facts as having been an important co-factor of the fatal outcome of this tragic case: essential medical findings were neither investigated by the primary treating hospital nor reported to the medical team of Swiss Air-Ambulance and emergency medical treatment of the acute compartment syndrome was refused in Italy.

In retrospect a measurement of tissue pressure of the affected compartment should have been installed, as this is a relatively simple and cheap method. When a compartment syndrome is diagnosed an immediate operation must be performed.

In addition an early appropriate fluid management could eventually have been beneficiary for the patient by preventing a deleterious renal insufficiency.

HIT II is a serious complication with a mortality rate of 30%.

(http://www.unc.edu/~rvp/RP_Anesthesia/Basics/HIT.html); (<http://www.mc.uky.edu/pharmacy/dic/criteria/HIT.pdf>)

Figure 2

Diagnoses at time of alarm	Diagnoses at time of hand-over in Italy	final diagnoses
Stable fracture of spinous processus C7 without neurological deficit	Stable fracture of spinous processus C7 with neurological deficits and suspected intramedullar bleeding C3-6 (MRT)	Stable fracture of spinous processus C7 , intraspinal hematoma with neurological deficits, unstable fractures of T 4, 6, 7, stable fracture of T 5
Left shoulder contusion and hematoma of left shoulder region	acute compartment syndrome of left upper extremity	acute compartment syndrome of left arm
Beginning renal failure (pre-renal aetiology suspected)	acute anuric renal failure (Crush syndrome)	acute anuric renal failure (Crush syndrome)
	susp. thrombosis of left subclavian vein	
		HIT II with: - occlusion of subclavian and jugular veins - occlusion of RH radial artery - hemothorax and multiple bleedings
		pre-existing cerebrovasc. infarction, treatment with ASA and oral anticoagulants
		pre-existing arterial hypertension with hypertensive dilatative cardiomyopathy, LV insufficiency and pulm. hypertension
		pre-existing spondylosis, cauda equina syndrome
	chronic acid indigestion	reflux esophagitis II
	pre-existing NIDDM	pre-existing NIDDM
		pre-existing resection of left lower lung due to hamartoma

References

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