

The implications of splenectomy in the tropical setting

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SPLenic INJURY IN AREAS where malaria is endemic is not uncommon,¹ and can lead to the need for splenectomy. The consequent asplenic state may significantly influence the potential for and risks of subsequent malarial, pneumococcal, and meningococcal infection. While precise figures on the incidence of these infections are lacking in most tropical settings, each is associated with significant morbidity and mortality.

A conservative approach with the intent of avoiding splenectomy, with its allied sequelae, is often adopted. In New Guinea, this practice was accepted by Clezy² and confirmed as practical by Hamilton and Pikacha.³ Splenectomy is sometimes mandatory and persistent conservatism can be fatal.⁴

Medical officers of the Australian Defence Force will be required to address these issues in a number of different circumstances. A decision on a person's "deployability" to a particular operational area may be required. On military operations, medical officers may be required to care for military or civilian personnel with splenic trauma or asplenia. Retention of a member in the Australian Defence Force after splenectomy is subject to medical review.

This article outlines two cases related to splenic trauma encountered in a brief interval while deployed in a tropical operational area. Both patients were civilians, but the questions of immediate and long-term care that needed to be addressed (such as splenic conservation, immunisation, malaria prophylaxis and the management of subsequent febrile illnesses) are equally applicable to military personnel.

Synopsis

- ◆ This report describes the management of two civilian patients by the Combined Health Element of the Peace Monitoring Group in Bougainville. The first required splenectomy after splenic trauma; the second was a long-term resident of New Guinea who had had a splenectomy 24 years earlier and who presented with a febrile illness.
- ◆ Asplenia is associated with an increased risk of several types of infections, including malaria. Therefore, conservative management of splenic trauma is preferred if feasible.
- ◆ In malarious areas, asplenic individuals are advised to adhere rigidly to an effective prophylaxis schedule and to be vaccinated in accordance with current guidelines.
- ◆ Australian Defence Force health personnel are likely to encounter the problem of splenic trauma and the management of patients after splenectomy in troops deploying to various theatres of operation, including Bougainville and East Timor.

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Background

Bougainville Island is the largest island in the North Solomons Province of Papua New Guinea. It is about 200 km long and up to 65 km wide. It is dominated by three separate clusters of volcanic cones located along a mountainous central backbone with a maximum height of 2745 m. Smaller Buka Island (56 km × 16 km) is separated from the northern tip of Bougainville Island by the narrow Buka Passage, and is mainly a plateau, bounded in the south-west by a range of hills up to 500 m high.

During this century, Bougainville has been a focus of national and international turmoil. Its incorporation into Papua New Guinea was not without dissenters. The development of the Panguna copper mine by Conzinc RioTinto of Australia was the catalyst for an independence movement headed by the Bougainville Revolutionary Army. Open conflict existed between various parties from 1988 to 1997.

Combined Health Element, Loloho, Bougainville, Papua New Guinea.

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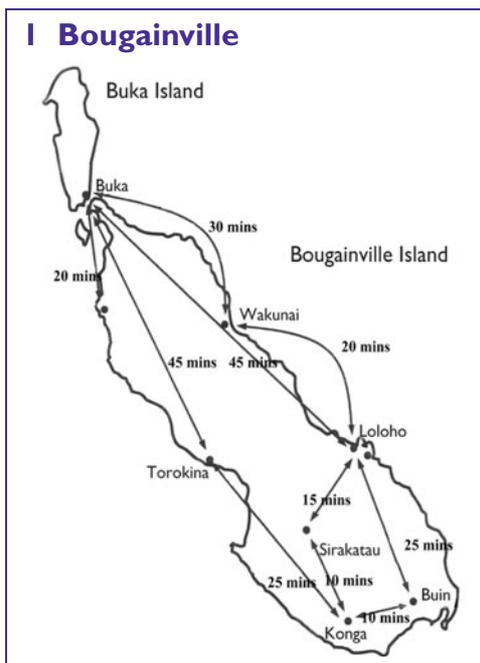
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The 1998 Lincoln Agreement (Department of Foreign Affairs and Trade)⁵ established a Truce Monitoring Group with personnel from Australia, Fiji, New Zealand and Vanuatu. This later became the United Nations-endorsed Peace Monitoring Group and ADF personnel are deployed to OP BEL ISI.

Transport is difficult and the Peace Monitoring Group places heavy reliance on the use of helicopters, with four Army Bell Iroquois (UH-1H) being deployed. Flying times in normal circumstances are 20 minutes Loloho–Buin, 75 minutes Buin–Buka and 45 minutes Buka–Loloho (Box 1).

Weather patterns change rapidly, and night-flying capability is strictly limited. The helicopters have a range of 295 km, an endurance of 150 minutes and can be configured with three stretchers transversely across the aircraft or six stretchers longitudinally. In the first configuration, medical staff can attend to patients from head to foot. In the latter configuration, access is only to the patient's head end. For a single casualty, transport on the floor of the passenger compartment is an option.

In September 2000 there were 259 personnel in the Peace Monitoring Group. Monitoring teams of about 10 members were deployed at critical sites around Bougainville. Each had a medical assistant. The greatest concentration of personnel was in the Logistics Support Team at Loloho, where the Combined Health Element was also located. One component of the Combined Health Element was a Level Three medical facility intended to provide emergency care for Peace Monitoring Group members, with facilities for emergency surgery, including craniotomy, thoracotomy, laparotomy and management of limb injuries (Box 2). This is justified by the time required to obtain medical help from Australia — three and a half to four hours flying time by Hercules C-130 from Townsville. The surgical facilities are supplemented with a single-bed high dependency area, a six-bed medium dependency ward, a ten-bed low dependency area, a laboratory and



2 Operating theatre of the Combined Health Element, Loloho



3 CASEVAC in progress, Case One



radiological support with allied staff. A Regimental Aid Post, staffed by medical assistants with medical officer support, is available for more routine matters.

The civilian medical facilities are centred on Buka. A hospital funded by the Australian development agency, AusAID, was opened in 1998 and is staffed by the Papua New Guinea government. AusAID also funds a medical officer in Arawa (7 km from Loloho), and Medecins Sans Frontieres have personnel in Buin. The last two posts have minimal surgical capacity.

Case reports

Case One

On the evening of Friday, 8 September 2000, a 34-year-old local male civilian was assaulted with a length of timber in Buin. He was beaten around the back and abdomen. He presented to Buin Hospital at 1230 hrs the following day.

Soon thereafter, the medical assistant with the Buin Monitoring Team was asked if help could be provided by the Peace Monitoring Group. He assessed the patient and noted the history combined with “abdominal pain, distension and guarding over the spleen.” Initial observations were a pulse rate of 120/m and a blood pressure of 80 mmHg systolic. Observations at 1500 hrs showed increasing tachycardia.

This information was relayed to Combined Health Element and Headquarters Peace Monitoring Group. Permission was granted by Headquarters for a CASEVAC. Because nightfall was approaching, the flight could only be concluded safely by returning the patient directly to Loloho.

The aeromedical evacuation team comprised an RAAF medical officer and medical assistant (Box 3). The helicopter departed from Loloho at 1610 hrs and reached Buin at 1635 hrs. Care necessary to prepare the patient for transport was given and the aircraft departed Buin at 1700 hrs. The patient remained stable and the transfer was

uneventful. At Loloho, the patient was unloaded to an ambulance and transferred 120 m to the Combined Health Element at 1726 hrs.

The patient was met in the Resuscitation Area of the Combined Health Element by the rostered five-member resuscitation team and initial assessment following EMST protocols was carried out. He was alert and complaining of generalised abdominal pain, aggravated by movement. A pulse rate of 88/m, respiratory rate of 20/m and blood pressure of 137/75 mmHg were recorded. A haemoglobin concentration of 91.8 g/L was reported and four units of O⁺ fully compatible blood were available from the unit's reserve of 15 units. In the presence of signs of peritonitis and blood loss, the patient was taken to theatre at 1800 hrs.

After rapid-sequence induction, total intravenous anaesthesia was administered. Normal physiological parameters were maintained throughout the operative and postoperative period.

At laparotomy, a disrupted spleen was found, with 1.5 L of blood in the abdomen. Conservation was deemed impractical and a splenectomy was carried out. No other injury was present. The patient was given a total of four units of packed cells.

Case Two

A caucasian male from a non-government organisation, aged 55 years, presented to the Regimental Aid Post of the Combined Health Element at Loloho on 12 September 2000 with malaise, headache, arthralgia and diarrhoea of 24 hours duration. He had been resident in New Guinea for 34 years and had been diagnosed as having malaria on several occasions when his presenting symptoms were similar to those at this presentation. A splenectomy was performed for traumatic rupture in Rabaul 24 years earlier. He was taking no antimalarial medication. He was febrile (37.8°C) with mild tachycardia (100/m). A blood sample showed leucocytosis ($15.8 \times 10^9/L$), but malarial parasites were not identified. With a provisional diagnosis of infective diarrhoea, he was given a single dose of ciprofloxacin. In deference to the possibility of malaria and his asplenic state, he was given mefloquine 250 mg (two tablets to be taken immediately and one eight hours later).

The patient presented again four days later, still unwell. He had not taken the mefloquine, as the diagnosis of malaria had not been confirmed. He was febrile (40.4°C) with pulse of 116/m. The leucocytosis was persisting ($16.8 \times 10^9/L$). No specific site of infection or causative organism was identified and the patient's condition settled over a period of days with intravenous amoxicillin.

Discussion

These two cases illustrate some critical features of splenectomy in the tropical setting.

The matter of surgical technique in the management of ruptured spleen is pivotal. Splenic conservation in the form of

partial resection, suture repair or mesh wrapping has become an accepted practice in recent years in certain circumstances. In Western communities, it is a ploy to avoid the recognised problem of overwhelming post-splenectomy sepsis.⁶ The practicalities of mesh wrapping in the military setting were considered recently in Melbourne, with support for the practice being evident.⁴ Factors to be considered before resorting to splenectomy include the surgical facilities and equipment available, both presently and in the future, and the extent of splenic injury.

The interrelationship between splenectomy and malaria raises several considerations. There are both preoperative and postoperative issues. Splenomegaly associated with malaria may increase the risk of spontaneous rupture or rupture after trauma, and the risk of infection with malaria is increased after splenectomy.

Splenomegaly in a malaria-endemic area is likely to be associated with an established malarial infection. This is less likely (<20%) in an individual who has only visited a malarious area.⁷ Acute and chronic malaria are associated with splenic rupture⁸ in association with and in the absence of trauma.⁹ The spectrum of splenic injury ranges from subclinical to catastrophic. Generally, in malaria-endemic areas, splenic preservation, as described earlier, is considered ideal, but it is not always feasible.¹⁰

The increased malaria risk after splenectomy is difficult to quantify, as controlled trials are not readily available. Animal models provide evidence of the importance of the spleen in defence against *Plasmodium* infections.¹¹ The spleen traps and clears abnormal erythrocytes, including those carrying *Plasmodium* forms. It is probably also involved in immune recognition of infected cells. Asplenic animals are easier to infect¹² and have a more severe illness¹³ than those with intact spleens.

Complications of malaria and death from malaria in asplenic patients have been reported, both in the tropics among populations of malaria-endemic areas¹⁴ and among non-immune visitors to malarious areas.¹⁵ Possibly the largest series in the tropics has been reported from Papua New Guinea.¹⁶ In this series (excluding cases lost to follow-up) 17 surgically asplenic patients and 33 patients who retained their spleens after splenic trauma were reviewed between one and 10 years after intervention. All 17 asplenic patients reported that they had malaria, compared with 18 of the 33 patients managed with splenic conservation and 23 of 50 in a control group ($P < 0.01$).

In addition to malaria, it has recently been noted in the North American community that many patients who have had a splenectomy have not had appropriate vaccinations or education in the lifelong nature of their risk.¹⁷ Surgical guidelines¹⁸ propose that those under 10 years of age, and all patients with immunosuppression or an associated immunodeficiency, should be vaccinated against pneumococcus, *Haemophilus influenzae*, meningococcus and hepatitis B. These proposals are incorporated into Health Policy Directive

232 for the management of ADF personnel with an absent or dysfunctional spleen.¹⁹ HPD232 also requires such personnel to carry, at all times, an appropriate antibiotic in case of the development of an infectious illness. HPD232 highlights the hazards of overseas travel, the value of carrying an alerting device, asplenia as a reason for rejection in the recruitment process, and the need for review in the event of splenectomy in a serving member of the ADF.

While it is accepted that asplenic members should not be posted to malarious areas, Health Policy Directive 215²⁰ recognises the potential for continued service after splenectomy and notes that the condition is not an absolute contraindication to deployment into such an area. It requires the member's Unit Medical Records to be clearly annotated "Member has undergone splenectomy" owing to the need for early diagnosis and vigorous treatment of any infection.

When asplenic ADF members are deployed in malaria-endemic areas, meticulous attention must be given to all aspects of malaria prophylaxis. Members of the Australian Defence Force are presently deployed in two areas of operation which are malarious: Bougainville, Papua New Guinea, with the Peace Monitoring Group (OP BEL ISI), and East Timor, with the United Nations Transitional Administration in East Timor (OP TANAGER). The incidence of malaria in the East Timor deployment between 20 September 1999 and 23 February 2000 as part of the International Force in East Timor (OP WARDEN) has been reported.²¹

Conclusion

Functional or anatomical asplenia carries a substantial risk of subsequently developing a severe infectious disease. Given the accumulating anecdotal evidence and small retrospective reports, the argument for splenic conservation in malarious areas is even stronger than in non-malarious areas. Immunisation and chemoprophylaxis with antibiotics may modify this risk of infection. Malaria chemoprophylaxis should be included in such risk management. With the prevalence of drug-resistant parasites in many malarious areas, asplenic individuals travelling in or being deployed to these areas should be aware of their greater risk of contracting and having complicated malaria and the need for effective prophylaxis.

Army Malaria Institute clinicians are available to discuss patient care whenever needed. Major Scott Kitchener can be contacted through the Army Malaria Institute (telephone 07 3332 4801 or email scott.kitchener@defence.gov.au). As an alternative, the clinician-on-call may be contacted (telephone 0407 150 384 or fax 07 3332 4800).

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