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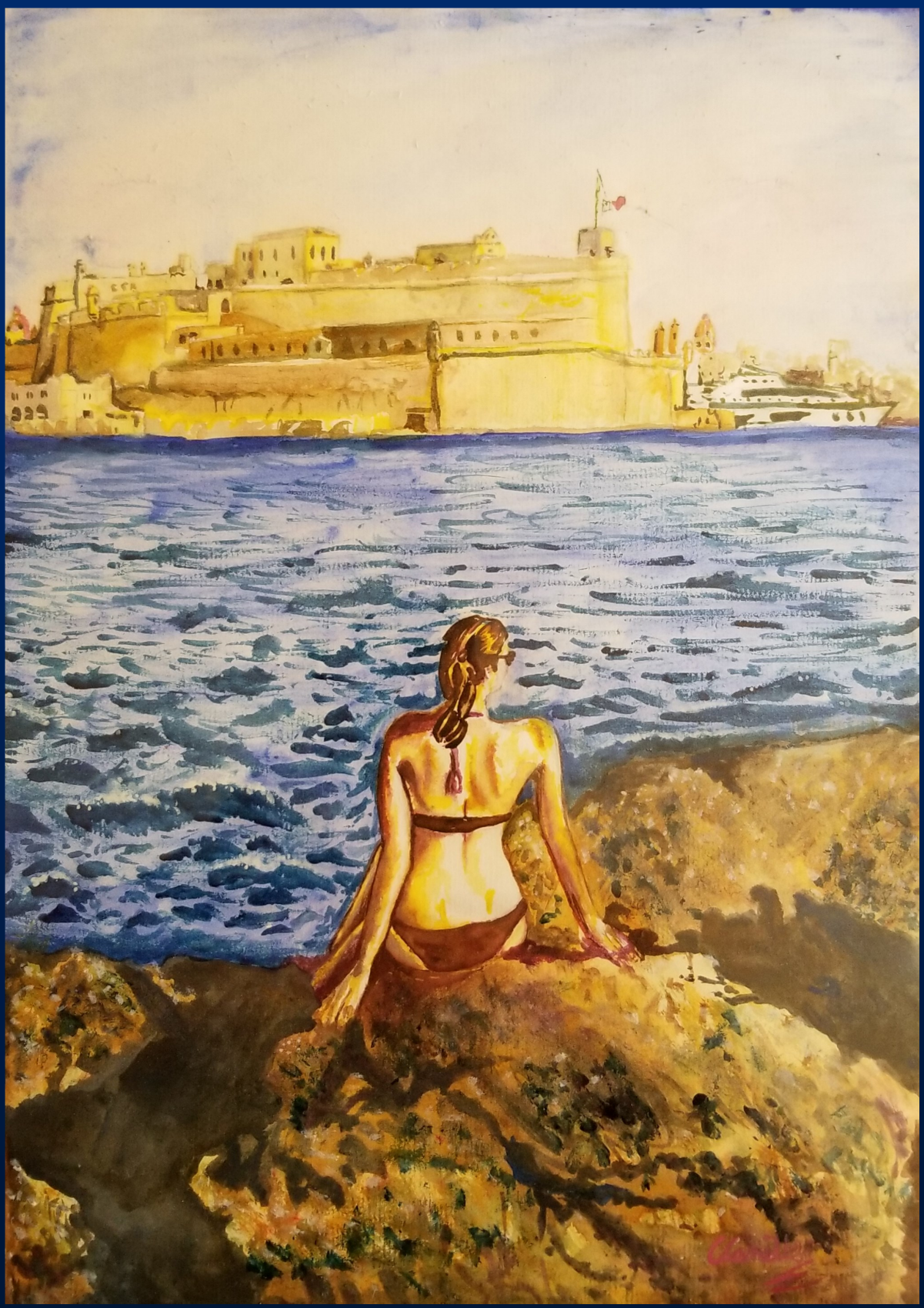

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Editorial

Exercise: an anti-cancer agent

Victor Grech

Elevated levels of insulin and insulin-like growth factor (IGF) have been implicated as risk factors for cancer, and indeed, fasting and fasting-mimicking diets appear to promote protection of normal cells and induce cancer cell death.[1] It is for this reason that it is believed that these two hormones are also the leading candidates to explain the correlation between obese and diabetic individuals and cancer risk.[1] Moreover, these individuals are less likely to have a good prognosis under such circumstances than leaner equivalents.[1-2]

The concern is that cancer in young adults is occurring with increasing frequency in developed countries and this may be associated with increasing population levels of overweight and obesity, which are reaching pandemic proportions.[3] The potential for a catastrophic increase in obesity-associated cancers in young adults is frightening.[3]

The modern trend for increasing sedentariness also prompts additional related concerns in that exercise has been shown to have wide-ranging benefits not only for the body and the mind, but also for the immune system.[4]

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It has been demonstrated that immune system effectiveness declines by circa 2-3% a year from the second decade of life, which is why the elderly are more susceptible to infections, auto-immune disorders and cancer.[4] T-cells are effective markers of immune function and it has been shown that vigorous activity preserves immune function such that individuals in their seventh and eighth decades of life have immune function comparable to twenty-year olds.[4]

More specifically endurance cyclists were shown to have significantly higher serum levels of the thymoprotective cytokine IL-7 and lower IL-6, which promotes thymic atrophy. Additional evidence of reduced immunesenescence, included lower Th17 polarization and higher B regulatory cell frequency than inactive peers. However, physical activity did not protect against all aspects of immunesenescence: CD28−veCD57+ve senescent CD8 T-cell frequency did not differ between cyclists and inactive peers.[4]

In physically active elderly individuals, preserved immune function may also allow better vaccine responses, such as to seasonal influenza.[4] The same study group was incidentally also shown not lose muscle mass or strength, and did not experience an increase in body fat, all of which are usually associated with the ageing process.[5]

In short, keeping fit and exercising into old age reduces cancer risk.

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Cover Picture:
'View of St. Angelo from the old fish market in Valletta'
Watercolours
By Christian Camilleri

Christian Camilleri is an anaesthesia trainee who began painting in childhood. His preferred medium and subject consist of watercolour figures, portraits and battle scenes. He derives inspiration from both Baroque and early 20th Century sources.

A 5-year study on the Epidemiology and Outcome of patients with Non-Traumatic Subarachnoid Hemorrhage in Malta

Annelise Aquilina, Daniela Zammit, Nicola Dingli

Abstract:

Objective: The aim of this study was to measure the incidence, treatment and outcome of non-traumatic Subarachnoid Haemorrhage (SAH) cases occurring in Malta during the five-year period between January 2011 and December 2015, in order to determine whether the lack of a local neurovascular service is associated with a poor outcome.

Method: A retrospective analysis of adult patients (above the age of 16) diagnosed with non-traumatic SAH was carried out. The data collected included a five-year period from January 1st 2011 till December 31st 2015.

Results: The incidence of SAH was estimated at 4.04 cases per 100,000 population per year. An underlying aneurysm was found to be the cause of the SAH in 69.1 % of cases investigated with CT angiography or Cerebral Angiography. In these patients, definitive management in the form of coiling or clipping of the aneurysm was carried out, within the period between January 1st 2011 and December 31st 2015, in the United Kingdom as part of an agreement between the two countries. The outcome of these patients measured at 6 months using the Modified Rankin Scale (MRS) was found to be excellent.

Conclusion*:* Despite our geographical and logistical limitations, outcomes of those patients with initial low Hunt and Hess (H+H) scores have not been affected by the lack of a local neurovascular service. Results are comparable to those of other international centres. Further studies looking into feasibility of expanding our local services are being carried out.

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Keywords

Subarachnoid haemorrhage, aneurysm, incidence, Modified Rankin Scale

Abbreviations:

- Subarachnoid Haemorrhage (SAH)
- Computerized Tomography (CT)
- Computerized Tomography Angiography (CTA)
- Magnetic Resonance Angiogram (MRA)
- Modified Rankin Scale (MRS)
- Hunt and Hess (H+H)
- Arterio-venous malformation (AVM)
- United Kingdom (UK)
- Mater Dei Hospital (MDH).
- Anterior communicating artery (ACA)
- Glasgow Coma Scale (GCS)
- Intensive Treatment Unit (ITU)
- Lower Urinary Tract Infection (LUTI)
- External Ventricular Drain (EVD)
- Cerebrospinal Fluid (CSF)
- Medical Out-patients (MOP)

Introduction

Subarachnoid Haemorrhage (SAH) refers to the extravasation of blood into the subarachnoid space between the pial and arachnoid membranes causing a haemorrhagic stroke.[1] It has an overall global incidence of 9/100,000 per year.[2] It may occur in a wide variety of clinical contexts including head trauma. Non-traumatic or spontaneous SAH is most commonly caused by a

ruptured cerebral aneurysm and to a lesser extent due to arterio-venous malformation (AVM).

Mortality due to SAH has been shown to be significant at 50% with 10-15% dying prior to arrival at hospital.[3]

In January 2017, the population of Malta was reported as 420,869.[4] Currently, there is only one study which describes the incidence and outcomes of non-traumatic SAH cases in the Maltese population. This was carried out over the 2-year period 2009-2010.[5] The purpose of our study is to re-evaluate the incidence and outcome of non-traumatic SAH during the five-year period between January 2011 and December 2015. The study was also aimed at determining whether the lack of a local neurovascular service, and hence the transport of patients to the UK for definitive treatment, is associated with a poor outcome.

Study Methods

All patients in the Maltese Islands who present with symptoms suggestive of a SAH are managed at the main public hospital, Mater Dei Hospital (MDH). They are admitted under the care of one of our four Consultant Neurologists. Patients who are seen at private clinics are quickly transferred to the general hospital MDH for further investigation and treatment since there are no other facilities on the island equipped to treat this condition.

Data of adult patients (≥ 16 years of age), with a clinical diagnosis of SAH from January 1st 2011 till December 31st 2015, was collected and analysed from 4 separate sources:

1. Patients who were referred abroad for treatment of ruptured aneurysms were obtained from the Treatment Abroad Committee;
2. Patients whose cause of death on the death certificate was listed as "Subarachnoid Haemorrhage" from the Death Register;
3. Patients who were discharged from Mater Dei Hospital with a diagnosis of SAH were identified from the hospital activity analysis, using ICD9 coding system;
4. Patients who were diagnosed with SAH on CT Brain were collected using the hospital computer system RIS Centricity Web.

All patients who were diagnosed with a traumatic SAH were excluded.

The patients who died out of hospital were identified solely from the Death Register. All other patients were identified from more than one of the above mentioned sources, therefore ensuring that the data collection was thorough and complete. This method guaranteed that there were no missed SAH cases that were admitted to hospital.

Results

The total number of patients with definitive spontaneous non-traumatic SAH over the five-year period was 85. Therefore, the incidence rate of SAH in the Maltese population is calculated to be 4.04 per 100,000 population per year. There was a significant increase from the previous study which calculated the incidence to be 3.16 per 100,000 population per year.

a) Patient characteristics

Of the 85 patients admitted with non-traumatic SAH over the study period, 49 (58%) were female and 36 (42%) were male. The mean age of presentation was 55 (range between ages 17 to 89). One patient died before arrival to hospital and before receiving medical attention. This patient was certified dead due to SAH according to their death certificate confirmed by post-mortem examination. The death of this patient was not analyzed further since the death happened outside of hospital and there were no available medical notes.

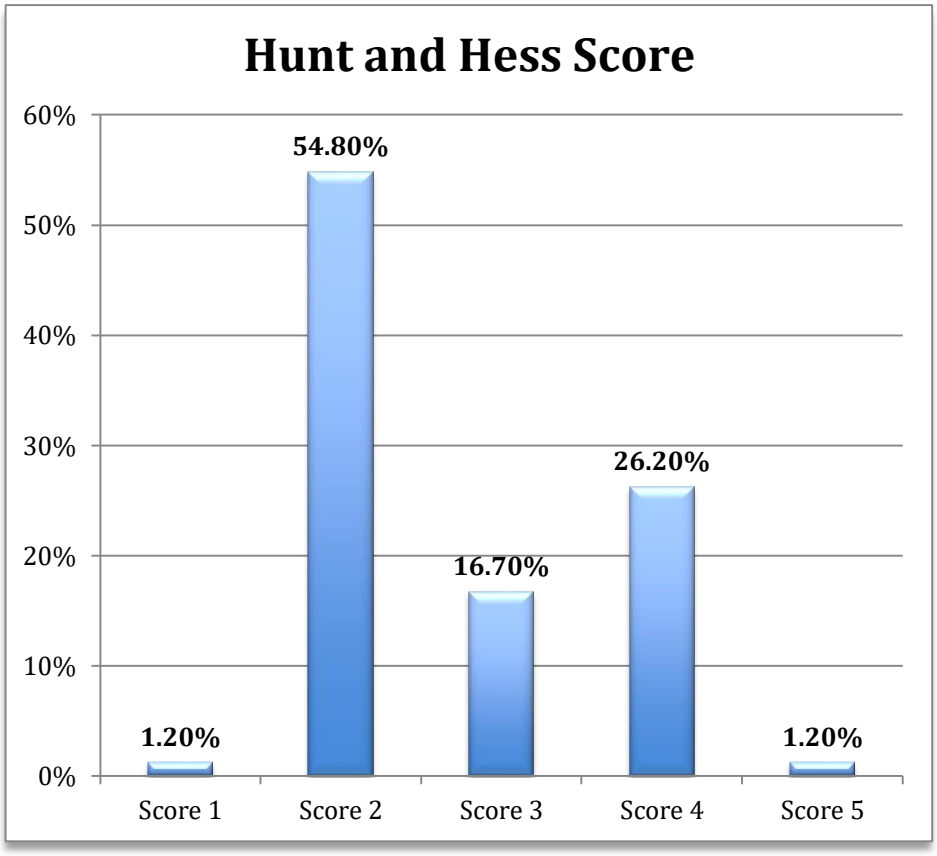
b) Clinical presentation

Almost all patients presented with sudden onset, severe, thunderclap headache, usually associated with photophobia, nausea and vomiting. 21 patients presented with loss of consciousness, 9 presented to hospital in an unresponsive state and 3 presented with confusion. One patient presented with a generalized tonic-clonic seizure, whilst another 5 patients presented with cardiac arrest needing resuscitation. Other commonly described symptoms included dizziness, neck pain, inappropriate/slurred speech and visual disturbances such as blurred or double vision. Tables 1 and 2 seen below demonstrate the H+H Scores on admission.

Table 1: *Hunt and Hess Scores on admission*

Hunt and Hess Score	Percentage for total of 84 patients
1	1.2%
2	54.8%
3	16.7%
4	26.2%
5	1.2%

Table 2: *Hunt and Hess Scores on admission - percentage for total of 84 patients*



c) Risk factor profile

The main risk factors described in our cohort of patients were: hypertension in 14 patients, smoking in 19 patients, hyperlipidemia in 4 patients and diabetes mellitus in another 4 patients. Other pre-existing conditions included: 1 patient with Systemic Lupus Erythematosus, 1 patient with Chronic Lymphocytic Leukaemia, 1 patient with glucose-6-phosphatase deficiency and 1 patient who was diagnosed with Hepatitis C.

d) Investigations

All patients, excluding the patient who died out-of-hospital, had a non-contrast CT scan of the brain. SAH was confirmed in all patients on CT scan except for two patients. One of these presented 7 days after onset of severe headache. This patient had an unremarkable CT scan, however a subsequent MRI of the brain confirmed a SAH and a right-sided anterior communicating artery (ACA) aneurysm. The other patient whose CT scan was reported as normal presented with an occipital

thunderclap headache radiating to the frontal area. A follow-up CT angiogram reported the presence of basilar artery spasm.

A lumbar puncture was only carried out on one patient and xanthochromia was confirmed with an opening pressure of 35 mmH_20, confirming the diagnosis of SAH.

Following a diagnosis of SAH on CT of the brain, 15 patients with a low Glasgow Coma Scale (GCS) and multiple co-morbidities were deemed unfit for angiography. They were not investigated with further imaging modalities and were treated conservatively. Of these, 14 patients passed away within the first few days of admission. The remaining patient had a 6-month post-diagnosis MRS score of 5 and was being managed at the rehabilitation hospital.

The other 69 patients were investigated for the possibility of underlying aneurysm with further imaging modalities including CT cerebral angiogram (CTA) or magnetic resonance angiography (MRA). 49 of them were found to have one or more aneurysm (71% of all those patients who received angiography). 40 of these patients were referred to the United Kingdom (UK) for definitive treatment of the aneurysm and 9 were not. Of these 9 patients who remained at MDH, 8 patients passed away during the admission and 1 survived to the 6-month follow-up visit. The 20 patients who were investigated with further imaging modalities but did not have any cerebral arteriovenous malformations or cerebral aneurysms detected were managed symptomatically at MDH. This is summarised in Table 3 and detailed in Table 4 below.

Table 3: *Summary of investigation and patient flow between 2011 and 2015.*

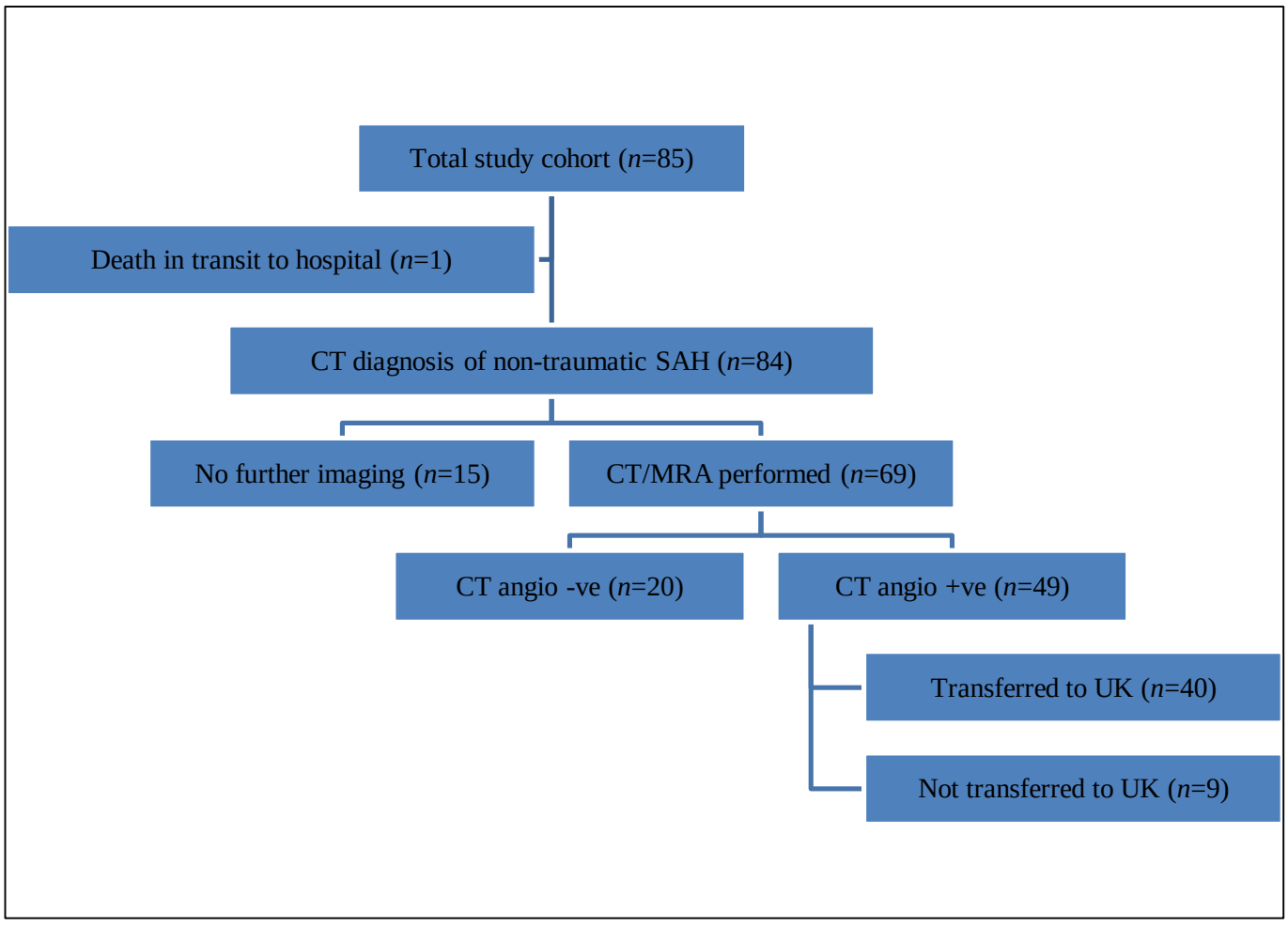


Table 4: *Details of investigation and patient flow in each of the 5 years of the study.*

	2011	2012	2013	2014	2015	Total
CT diagnosis of non-traumatic SAH	16	15	19	15	19	84
No further imaging	7	0	4	3	1	15
CT angio -ve	4	6	4	2	4	20
CT angio +ve and transferred	5	8	9	8	10	40
CT angio +ve and not transferred	0	1	2	2	4	9

Table 5: *List of post-op complications reported in 16 patients treated abroad*

Patient	Complications
1	Frontal lobe ischemia rendering him aphasic, global weakness 3/5, apathetic; LUTI E.Coli
2	Cerebral salt wasting syndrome
3	Staphylococcal sepsis; fluctuating symptoms of aggression and visual hallucinations; severe postural hypotension
4	Cataracts; right eye ptosis
5	Vasospasm; drop in GCS
6	Seizures
7	Puncture site hematoma/pseudoaneurysm
8	UTI
9	Intracerebral bleeding; Bilateral ischemic infarcts
10	Frontotemporal stroke; Right hemiparesis
11	Neurogenic pulmonary oedema; Nosocomial chest infection
12	Vasospasm
13	Long QTc intervals on ECG
14	Re-bleed from aneurysm
15	Ventriculitis with coagulase-negative streptococcus, followed by CSF leak from his EVD site
16	Hydrocephalus, extreme agitation; multisystemic pathology including Klebsiella Pneumoniae chest infection.

Table 6: *Modified Rankin Scale (MRS)*

	MRS								
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Lost to f/u**	***Total***
Number of patients with no angiography	0	0	0	0	0	1	13	1	*15*
Number of patients transferred to UK	17	8	1	1	1	2	1	9	*40*
Number of patients with +ve CTA but not transferred	0	0	0	0	1	0	8	0	*9*
Number of patients with -ve CTA and not transferred	16	2	0	0	0	0	2	0	*20*
Total	*33*	*10*	*1*	*1*	*2*	*3*	*24*	*10*	*84*

e) Management

Most patients were admitted to Neuro-Medical Ward, however the patients with a low GCS on admission were managed directly in Intensive Care. Upon diagnosis of SAH, treatment with Nimodipine, lactulose and analgesia was immediately initiated.

f) Length of Stay

Of the 39 patients that were transferred to the UK for further treatment, 31 of them had an average stay in Malta of 2.84 days before being flown abroad. 5 patients required an extended stay at ITU in view of initial low GCS, averaging 26 days. 2 patients had missing information in their medical file and 1 patient was flown to his home country with no further input regarding management.

The average stay of 27 patients that received treatment abroad was that of 19 days. This has to take into consideration their post-op care and any complications that arose. 11 patients did not have the official discharge letter in their medical file, hindering us from obtaining official dates and any procedures done. One patient spent 10 days in hospital; however, no treatment was eventually given.

g) Outcome of SAH

Patients in general had a good long-term outcome from their coiling or clipping procedure. However, a number of complications were reported post-op, as indicated in Table 5.

h) Complications occurring in patients with SAH who did not undergo coiling or clipping

One patient who was managed conservatively suffered a small area of infarction left frontal region, including severe headaches (repeat CT Brain showed no hydrocephalus but resolution of SAH) and high blood pressure.

i) Post-treatment follow-up

Patients were advised to have repeat imaging between 4 to 6 months after the procedure in Malta. This ranged from CT scans, an MRA or a cerebral angiogram, depending on the patient's case. Every patient was followed up at MOP to assess for any residual symptoms and to ensure that the aneurysm/AVM was successfully treated with no evidence of a recurrence of bleeding.

Two patients who were referred to the UK for definitive treatment were not of Maltese nationality. They did not return to Malta after transfer abroad and were lost to follow-up. The remaining patients

who underwent coiling or clipping and returned from the UK, were followed up at Neurology Outpatients for at least 6 months.

j) Mortality

Out of the total of 85 patients diagnosed with non-traumatic SAH, 25 patients passed away during the admission at MDH or at the rehabilitation hospital before the 6-month follow-up. (29% mortality). All deaths occurred within an average of 5.41 days. Out of the total 40 patients who were transferred to the UK for definitive treatment, 39 of them survived past the 6 month follow-up. The remaining patient who was transferred, passed away after 30 days in the UK post-coiling. Eight out of nine patients who were diagnosed with an aneurysm on CTA and not transferred abroad succumbed to their illness. The 6-month mortality of patients transferred to the UK was therefore 2% while that of the patients who were not transferred was 88.9%. The majority of the deaths occurred in patients with a H+H score of >3 on admission and in patients who were deemed unfit to undergo further investigations during the admission and not stable enough for transfer abroad.

It must be noted that two of the patients who were transferred for treatment abroad were lost to follow–up since they returned to their respective home countries after definitive treatment.

This left 7 patients from the transferred abroad group who were lost to follow-up or did not attend the 6 month post treatment review.

Table 6 shows the Modified Rankin Score at 6 months after the initial presentation for the patients who were followed-up.

Discussion

All patients diagnosed with a SAH are ultimately referred and managed at MDH, the main acute hospital in Malta and the only hospital offering the services of a critical care unit. In our study, the data was compiled in such a way so as to represent all cases of non-traumatic SAH which occurred in Malta during the study period chosen. The incidence of 4.04 per 100,000 population per year is on the lower side of average incidence data however it has shown a rise when compared to the previous incidence of 3.16 per 100,000 population measured during the period between 2009-2010. The worldwide incidence of non traumatic SAH has been shown to be about 10.5 per 100,000 person years. [10]

Patient who are diagnosed with a ruptured aneurysmal SAH, should ideally receive definitive treatment as early as possible. Every effort is made from our end in order to minimize delays in transfer of patients abroad, however certain logistical limitations may be inevitable; such as when the patient remains unfit for air transfer and requires stabilization. Our audit shows that the mean number of days from initial presentation to definitive treatment in the UK was 2.84 days.

The average hospital volume estimated from our results adds up to a value of 17 cases per year. The association between outcomes for patients with SAH and hospital treatment volume has been described in multiple studies.[6-8] It has been shown that hospitals which treat more cases of SAH, have substantially lower rates of in-hospital mortalities, when compared to low-volume hospitals.[6] Better outcomes at high-volume hospitals may be attributed to the specialized services and staff expertise. The definition of high-volume hospitals described in the literature varies. It ranges from cut-points between 5 cases per year[7] and up to 45 cases per year.[8] For ruptured aneurysms, it has been shown that an institution using coil embolization would be expected to have fewer in-patient deaths when compared to an institution which never used this technique.[8]

Selection bias giving rise to confounding factors occurs since certain high-risk and unstable patients with ruptured aneurysms are not considered for coil embolization and physicians are reluctant to transfer such cases with a poor prognosis.[8]

The literature shows that patients who are acutely ill with high Hunt and Hess grades after SAH can however undergo successful coil embolization despite their poor medical condition and a high frequency of vasospasm. In one series, 27 patients with 29 aneurysms were all H+H grade 4 or 5 (poor grade) and were treated within 72 hours after ictus. Sixteen patients (59%) died within 30 days of SAH, whereas 11 (41%) survived. Eight patients (30%) had a favorable outcome (MRS $\leq$2). Therefore, these results were similar to what was seen in aggressively treated surgical patients. Many of these patients have a good clinical outcome, although there still remain high rates of morbidity and mortality with this disease.[9] Such a consideration would therefore justify ongoing efforts at introducing a neurovascular service

locally.

The main limitation of this audit is the small population size, giving our study a low power.

Conclusion

Our study has shown that the incidence of non-traumatic SAH in Malta remains on the low-incidence range, when compared to other countries. CTA and MRA were successful in diagnosing at least one aneurysm in each of the 71% patients with a positive CT brain. Despite the low incidence and the logistical limitations for delivering patients to centres in the UK for definitive treatment of aneurysmal bleeds, our standard of care and survival rates are not below those of other centres. The 6-month mortality of patients transferred to the UK was 2% while that of the patients who were not transferred was 88.9%.

However current efforts at introducing a specialised neurovascular service locally could still result in the added benefits of avoiding logistical problems in transfer of patients, reducing costs, and in the possibility of treatment of the high-risk patients who would otherwise not receive definitive coiling of the aneurysm. Further studies would then be required in order to assess such a service and the outcome of both the low- and high-risk patients with non-traumatic SAH receiving treatment.

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Original Article

A prospective audit examining non-attendance at a surgical outpatients clinic in Mater Dei Hospital, Malta, after the introduction of a text-messaging reminder system

Dylan Attard, Bertha Grech, Gordon Caruana Dingli

Abstract

Non-attendance rates at hospital outpatients clinics has always proved to be a serious problem. Missed appointments cause delays in patient management, impacting patient outcomes. Mater Dei Hospital introduced a text-messaging reminder system in July 2017 in an attempt to reduce non-attendance rates and this study assesses the efficacy of this system. Four surgical outpatients clinics were observed over a period of one month and the total number of appointments documented. Non-attenders were contacted via a telephone call and asked to explain their non-attendance as well as asked if they had received a text-message reminding them of their appointment.

Out of a total of 227 appointments (205 females, 22 males), 49 patients did not turn up, representing a 22% non-attendance rate. Out of these 49 patients, 41 answered their phone and were interviewed for this study. The rest were not reached because a contact number was not in their physical and electronic records (2 patients) or they did not answer their phone at all (6 patients). Out of the 41 contacted, 39% claimed they did not receive a text message reminding them about their appointment whilst acknowledging that they all have a functional mobile phone and they know how to receive and read a text message.

This study shows that non-attendance rates of 30%[2] decreased by 27% to 22% after the introduction of text-messaging. It is hoped that this system will further decrease not attendance rates if more patients have a registered mobile phone number in the hospital electronic records system.

Keywords

Outpatients, Text-message, Non-attendance

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Introduction

The demand for outpatient consultation services at Mater Dei Hospital is increasing year by year.[3] The increasing demand for a high level of healthcare, increase in population, increased life expectancy and technological developments all continue piling more pressure on our healthcare services, putting a strain on Mater Dei's resources. This lengthens outpatient waiting lists and the situation is made worse by a high rate of no-shows. Studies carried out at Mater Dei Hospital in 2016 noted that 20% of the scheduled appointments for five clinical specialities under review did not turn up.[3] This phenomenon is also seen abroad.[1] The commonest reasons cited in literature have been noticed to be independent of speciality and include

forgetfulness, working commitments, confusion over date, illness and transportation.[4]

In 2014 an audit was performed in our clinic showing that there was a 30% non-attendance rate and the authors suggested the introduction of a text-messaging reminder system to improve attendance levels. [2]

Initiatives were recently introduced at Mater Dei to improve attendance rates at outpatients. These included phoning patients before their scheduled appointment in August 2016, and the introduction of the text-messaging reminder system, which was started in July 2017. The latter was shown to reduce such no-shows to 11% from an average of 22% in the targeted areas but despite such achievements, the non-attendance rate remains disturbing and continues to negatively influence Mater Dei's logistical and operational arrangements and increase waiting times.[3]

This study set out to determine the non-attendance rate at the surgical outpatients clinic and to compare it to the non-attendance rate in a previous study and also to assess how many patients received messages and the reasons why patients who received a message still missed their appointment. We also studied the number of patients who notified the outpatients that they would not attend and whether this lead to the appointment being re-allocated to another patient.

Method

The study was conducted at Mater Dei Hospital, Malta and approved by both the local audit committee and by the data protection management. Data from four weekly outpatient clinics of a general surgical firm with a specialist interest in breast surgery was collected. The total number of patients listed in each clinic was documented together with the nature of their appointment (new care or follow up), patient's age and sex. Patients who had failed to attend were then contacted via telephone and they were verbally consented to participate in a questionnaire. They were then asked if they had received a text-message reminding them of the appointment, whether they had notified the surgical outpatients department of their non-attendance from beforehand and the reason why they had failed to attend. Confidentiality was emphasised to all patients. Patients' contact details were obtained from their electronic records and if they had failed to answer or did not have any contact details available electronically, their physical records were obtained, to search for alternative contact details.

Results

Out of a total of 227 appointments (205 females and 22 males, mean age of 54 years) to attend one of the four outpatient clinics analysed for this study, 49 failed to attend, representing a 22% non-attendance rate. Follow up cases had a higher rate of non-attendance compared to new cases (80% *vs* 20% respectively).

Out of 49 patients who failed to turn up for their appointment 41 were contacted via telephone, all of whom agreed to take part in the short questionnaire over the phone. The rest couldn't be reached because there were no contact details available (both electronically or on the patient's paper file) or they did not answer their phone. Out of the 41 contacted, 39% (19 patients) claimed they did not receive a text message reminding them about their appointment whilst they all acknowledged that they have a functional mobile phone and they know how to receive and read a text message. Out of these 19 patients who did not receive the text-message, only 3 were new cases.

Only 39% of all the non-attendees contacted the surgical outpatients department from beforehand and postponed their appointment to another date. 22% (9 patients) did not know at all about the appointment and 12% (5 patients) forgot completely about the appointment. Seven patients knew about their appointment but they could not make it and did not inform anyone.

Discussion

Mater Dei Hospital introduced the automated text-messaging system in June 2017 with all patients scheduled to have an outpatient appointment receiving the text-message ten days and also two days before. Contact details are obtained from 'CPAS Patient Master Index', which is the patient database which the Ministry of Health uses across all its hospitals, health centres and other patient services. All text-messages are in English and contain name of clinic, date and time, initials of name and surname and locality. Mater Dei's contact number is also included.

A similar study to this one carried out in 2014, documented a non-attendance rate of 30%.[2] In 2017, just a couple of months after the text-

messaging system was introduced, a performance audit carried out by the National Audit Office on Mater Dei noted an 11% decrease in the non-attendance rate, concluding that the new initiative is successful. This study has shown that non-attendance rates of 30% decreased by 27% to 22% in this clinic after the introduction of the text-messaging reminder system.[2]

It was noted that patients who could not keep their appointment and contacted the hospital to reschedule remained on the clinic list. Unfortunately these appointments were not reallocated to another patient. The system would be more efficient if these slots were used up but it may be difficult to do so at short notice.

Nearly 39% (with a mean age of 53 years) of all the non-attendees claimed that they did not receive a text-message from Mater Dei Hospital reminding them of their appointment. It is possible that some of these may have forgotten or they were reluctant to own up. However it does raise an alert that the hospital needs to keep mobile telephone numbers updated on the electronic records system. Wards and outpatient clerks should be reminded to update these records after every patient visit. It might also be possible to share a database with telephone service providers if this does not contravene data protection legislation.

In 2015, Mater Dei Hospital incurred an expenditure of €204 million with an estimated €32.2 million spent on the outpatient department.[3] It was estimated that the average cost to provide a consultation visit as an outpatient costs around €3.18 euro per minute, depending on the speciality. Literature shows the a text-messaging system is very effective in reducing non-attendance rates as well as is the most cost-effective way of doing so when compared to letters or phone calls.[5] The expense of each text-message could not be obtained due to contractual obligations but it can be assumed that such expense compares very well to what has been documented in other studies, and this can be extrapolated to be cost effective when it has proven to increase attendance rates.

The limitations of this study are that it was conducted over only four clinic sessions and it was restricted to a single cohort of patients. It is also possible that the improved attendance rate was due to other factors besides the text-messaging system e.g. the introduction of the patient's charter mentioning patient responsibility.

Conclusion

A previous study showed a 30% non-attendance rate and suggested the introduction of a text messaging reminder system.[1] The system was introduced and this study showed a 27% decrease in non-attendance to 22% at the same clinic. The authors suggest that all patients' mobile telephone numbers are added to the electronic database. When patients call to reschedule their appointments the cancelled appointment should be re-allocated to improve efficiency of the clinic.

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Original Article

Preliminary Trabeculectomy results using the Moorfields Safer Surgery Technique in Malta

Matthew Fenech, Adrian Mifsud, Francis Carbonaro

Abstract

Purpose: To review the results of the Moorfields Safer Surgery System (MSSS) for trabeculectomy, recently introduced in Malta.

Methods: Patient files were reviewed from data collected over an 18 month period, from Mater Dei Hospital. Files of all patients undergoing primary trabeculectomy with a minimum of 12 months follow up data available were reviewed. Primary outcome measure of success was defined as a 30% drop in final post-operative intraocular pressure (IOP) at 1 year. The secondary outcome measure of success was a final post-op IOP of less than 21mmHg. Unqualified success was defined as a satisfactory IOP without the need of anti-glaucoma medication, while qualified success was defined as a satisfactory IOP in those patients requiring anti-glaucoma medication.

Results: 43 eyes (mean age = 66.2 yrs ± 11.7) were analysed. The mean pre-operative IOP was 27.0mmHg ± 4.6. The mean post-op IOP at one year was 15.3mmHg ±2.7. Unqualified success for the primary outcome measure was achieved in 64.1% of patients while the qualified success was achieved in 82.1%. Unqualified success for the secondary outcome measure was achieved in 72.7%, while a qualified success of 94.8% was obtained. There was a 6.8% failure rate.

Conclusions*:* The results from this first review using the Moorfields safe surgery system for Trabeculectomy surgery in the Maltese islands compares well to the current literature.

Key Words

5- Fluorouracil, Malta, Mitomycin, Moorfields safer surgery, Trabeculectomy

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Introduction

Trabeculectomy was first described over forty years ago by Sugar in 1961[1],further promoted by Cairns and Philips in 1986.[2-3] It is currently the most commonly performed operation for uncontrolled glaucoma.[4] The procedure has undergone various alterationsover the years, the main one being that described by Peng Khaw, commonly known as the Moorfields Safer Surgery System (MSSS).[5]

The aim of this study was to determine whether the MSSS, recently introduced to Malta by the senior author (FC), was resulting in outcomes which were safe and satisfactory when compared to larger international reviews. Advancements in today's contemporary trabeculectomy techniques include the likes of antifibrotic agents like 5-fluorouracil (5-FU) and Mitomycin–C (MMC), the use of adjustable or releasable sutures, the application of an intensive post-operative treatment regimen and the implementation of glaucoma fellowship programmes,[6] all of which have led to reduced post-operative complications and improved surgical outcomes.[4]

We set out to review the outcomes of the MSSSS in Malta in patients with a minimum of 12 months follow up.

Methods

Ethical approval was obtained through the ethics department at Mater Dei Hospital Malta. The study adhered to the Declaration of Helsinki. All the trabeculectomies were performed by one single consultant surgeon (FC) between 19th of November 2013 and the 5th of March 2016 *(n=43)*.

A retrospective review was performed over a period of 3 months. The data collected in this study (FCAR) was subsequently compared to other published studies.

A total of 43 eyes from 39 patients were used in this study. Demographic data, the duration and number of antiglaucoma medications being used, best corrected visual acuity (BCVA) pre-operatively and 12 months post-operatively, the aetiology of glaucoma and the intra-ocular pressure pre-operatively and 12 months post-operatively were recorded.

Exclusion criteria included previous trabeculectomy attempts, any other prior glaucoma surgery, follow up period of less than 12 months and patients undergoing a combined surgical procedure.

Failure rate was defined as the necessity for cyclodiode, revision of surgery or progression to tube surgery.

Standardised surgical approach

The surgical approach used in all cases was that described by Khaw as part of the MSSS, with the aim of improving posterior aqueous flow accompanied by more diffuse drainage blebs. Such success was achieved by applying Mitomycin-C in the subconjunctival space and the application of releasable sutures to the scleral-flap.[7]

Trabeculectomies were performed by the same consultant ophthalmic surgeon in order to eliminate any variability in results that would have been obtained had several different consultants contributed to the study.

Outcome measures

Outcome measures vary from study to study, making it difficult to compare results directly. Primary outcome measure of success was defined as a 30% drop in final post-op IOP at 1 year. The secondary outcome measure of success was a final IOP less than 21mmHg. Unqualified success was defined as a satisfactory IOP of less than 21mmHg without the use of IOP-lowering drops, while qualified success was defined as a satisfactory IOP with concurrent use of IOP-lowering drops. Failure was defined as unsatisfactory IOP of greater than 21mmHg, whereby further treatment such as diode laser or tube surgery was required.

Results

43 eyes of 39 patients were reviewed, all undertaking trabeculectomy surgery at Mater Dei Hospital, Malta. The mean age of patients was 66.2 years (SD 11.7). The predominant glaucoma type was primary open angle glaucoma (POAG), occurring in 59.5%, while 16.7% had pseudo-exfoliation (PXF), 7.1% had primary angle closure glaucoma (PACG) or rubeotic glaucoma, with the remainder comprising of congenital, chronic open angle and phacomorphic (Figure 1).

The mean number of topical mediations used pre-operatively was 2.73 (Figure 2). A total of 71.4% of patients were on 3 or more topical medications pre-operatively. Furthermore, 9.5% of patients were on oral anti-glaucoma medication (Diamox, Duramed Pharmaceuticals Inc, Cincinnati), USA) prior to surgery. The mean number of topical medications used post-operatively was 1.25 (Figure 3).

Early complications occurring in the first 2 post-operative weeks occurred in 47.6% of patients. 14.3% of patients experienced loss of more than 1 line of Snellen visual acuity over 1 year (Table 1). Late complications were considered to be those that occurred more than 2 weeks post operatively. A comparative assessment of the complications observed in our cohort to those observed in a selection of other studies may be seen in Table 2.

The mean pre-operative IOP was 27.0 +/- 4.6mmHg. Mean post-op IOP was 15.3mmHg ± 2.7. Comparison of pre-op and post-op IOP shows a mean reduction of 11.7mmHg (Figure 5).

Unqualified success for the main outcome measure was achieved in 64.1% of patients while qualified success was achieved in 82.1%. Unqualified success for the secondary outcome measure was achieved in 72.7%, with a qualified success of 94.8% (figure 4) being seen. A failure rate of 6.8% was observed.

***Figure 1**: Percentage distribution of type of glaucoma*

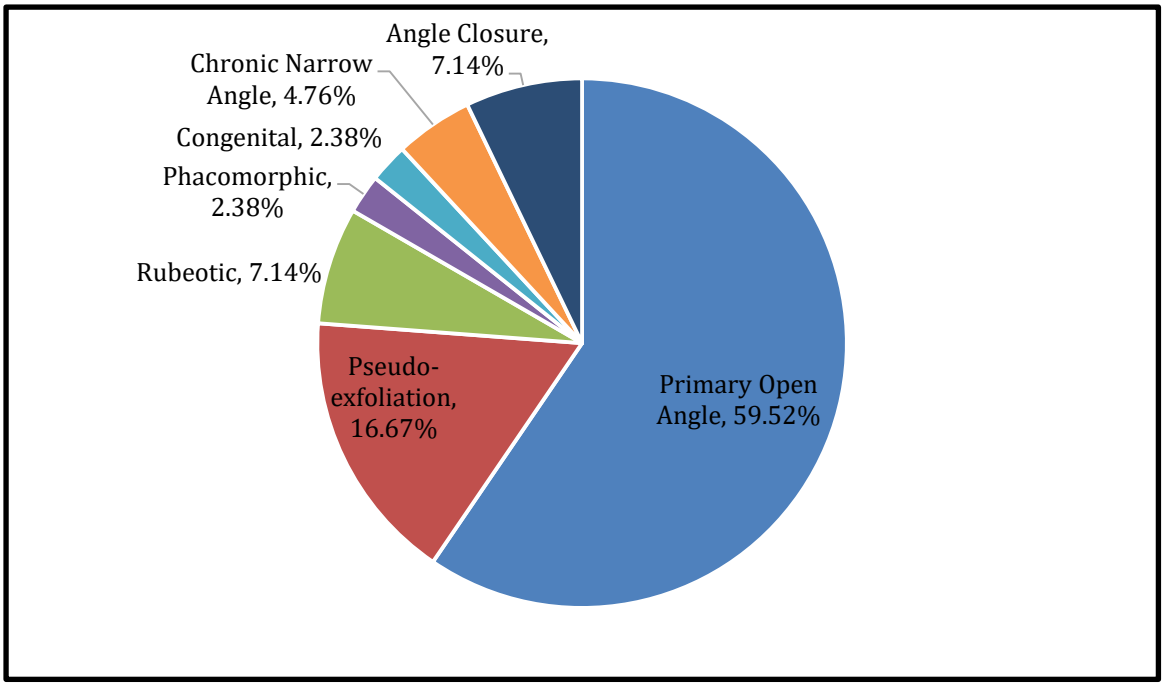


***Figure 2:** IOP lowering regimen (drops) pre-op*

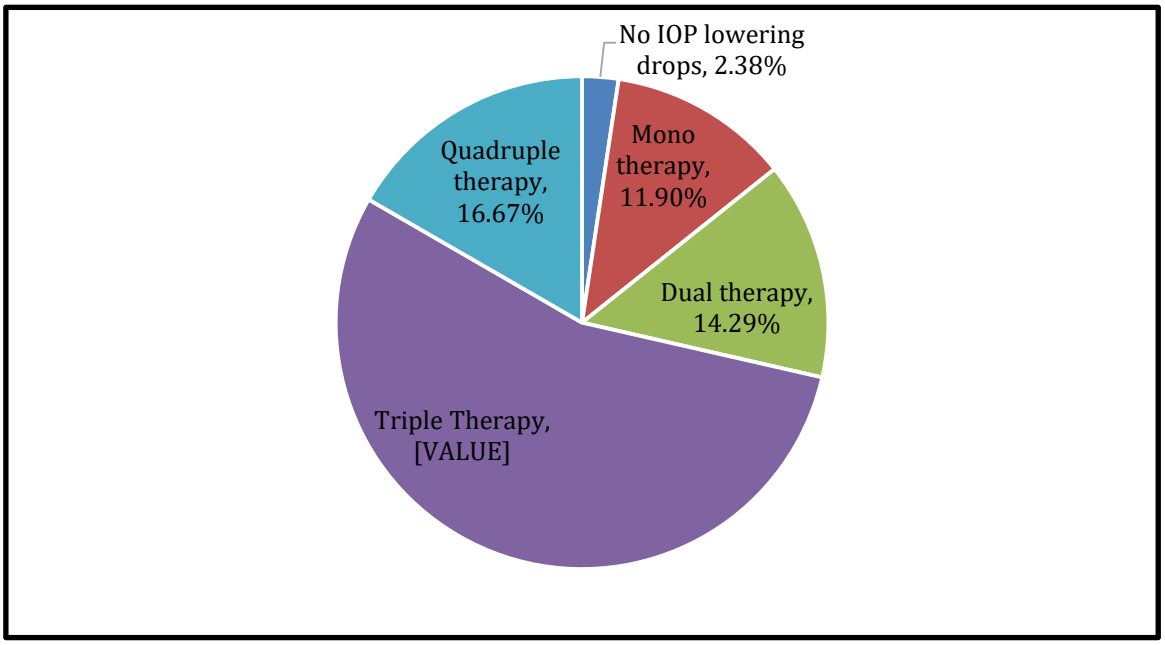


***Figure 3**: IOP lowering regimen (drops) post-op*

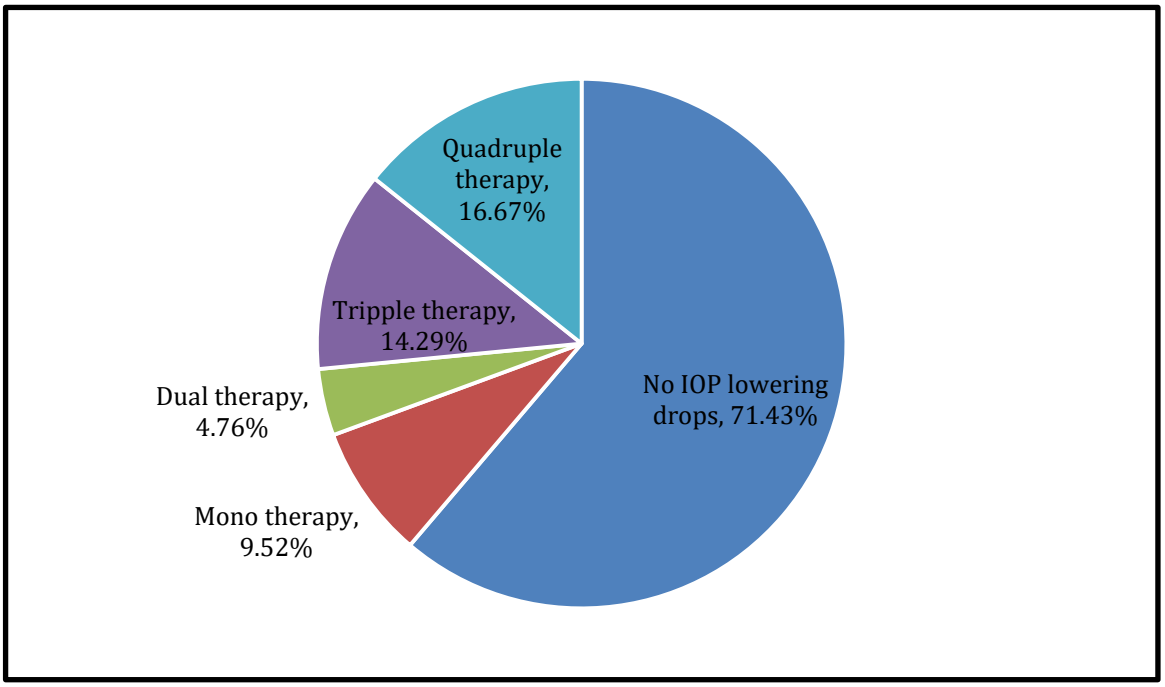


***Table 1:** Early complications occurring within 2 post-operative weeks and late complications after 2 post-operative weeks*

Post-operative complications	
Early complications - <2 weeks	**Current study (%)**
• Hyphaema	26.19
• Hypotony	9.52
• Choroidals	4.76
• Shallow anterior chamber	2.38
Late complications - >2 weeks	
• Loss of >1 line of Snellen visual acuity	14.3
• Cataract	11.9
• Corneal ulceration	4.76
• Macular oedema	2.38
• Retinoschisis	2.38

Table 2: *Comparison of the post-operative complications between the current study other published studies. (CBIITS; Collaborative Bleb-related Infective Incidence and Treatment Study, TNTG; Trabeculectomy in Normal Tension Glaucoma Study, NST; National Survey on Trabeculectomy study, SESTS; Southeast Scotland trabeculectomy surevy*

		Post-operative complications; Study comparison				
Complication	Current study	Kirwan et al.	CBIITS	TNTG study	NST study	SESTS study
Early						
Hyphaema	11.9	6	2.7	3.6	20.2	3.6
Hypotony	9.52	3	1.3	2.3	24.3	17.8
Shallow AC	2.38	0.9	3.1	23.9	23.4	0.8
Late						
Cataract	11.9	N/a	N/a	3.6	20.2	3.6
Loss of >1 Snellen line of visual acuity	14.3	N/a	N/a	18.8	10.9	N/a
Endophthalmitis	0	0.5	0.97	0	0.2	0
Cystic Blebs	2.38	7.7	0.36	N/a	3.4	N/a

Figure 4: *Comparison of unqualified and unqualified success rates in the primary and secondary outcomes between the FCAR study and other published studies*

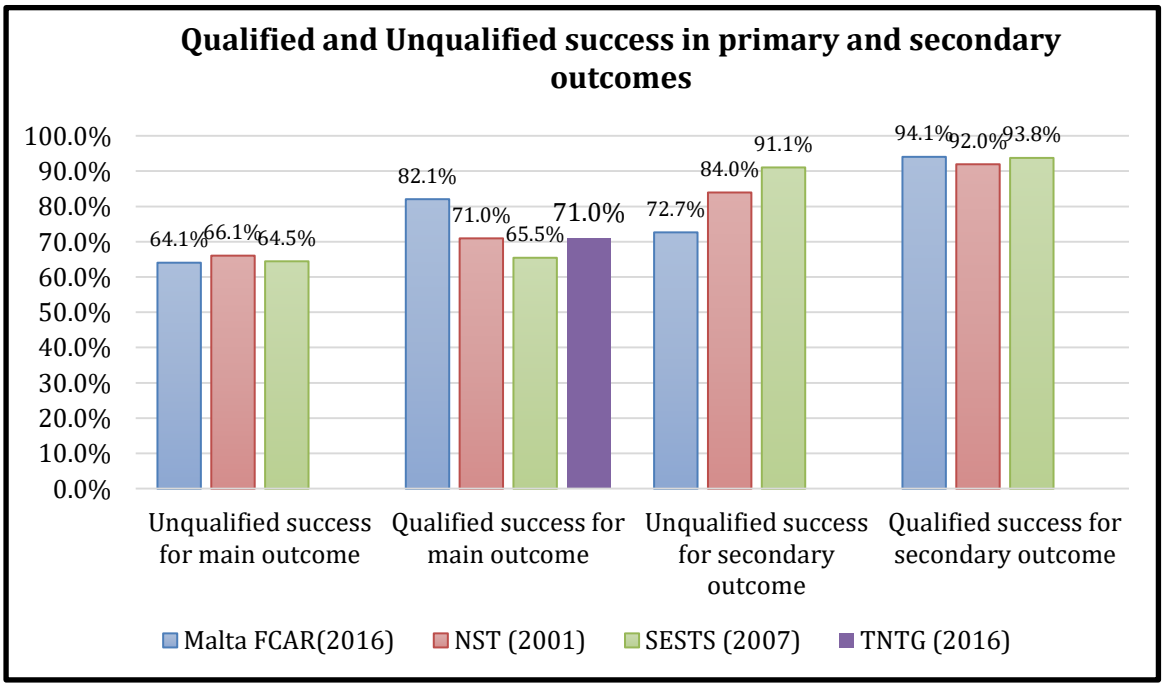
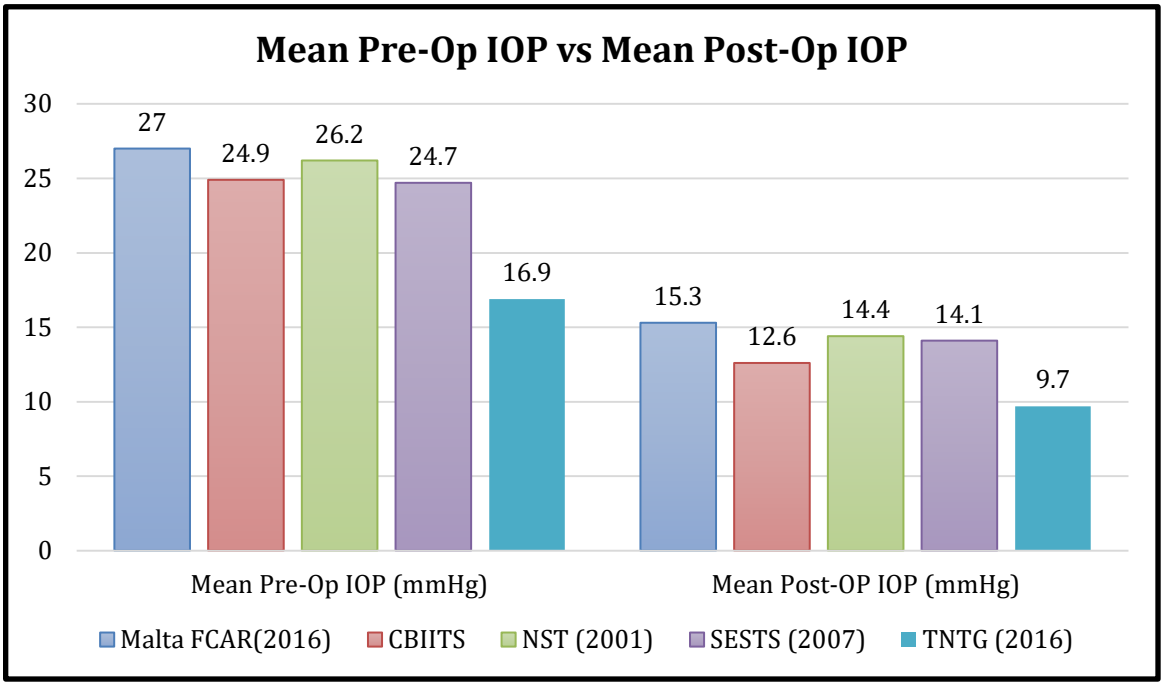


Figure 5: *Comparison of mean pre-op IOP and mean post-op IOP between the FCAR study and other published studies*



Discussion

Our study set out to assess current practices of trabeculectomy in Malta, by comparing the outcomes and results 1 year post operatively with the results obtained in similar studies. Unfortunately, although sseveral studies evaluate the effect of trabeculectomy using the MSSS, it is difficult to compare the surgical results because there are small differences in the success criteria and patient demographics. Studies that included only surgical-naive subjects seemed to show results that were better than those subjects who had a surgical history.[7]

The UK National Survey of Trabeculectomy (NST) study[8] and the Southeast Scotland Trabeculectomy Survey (SESTS) [9] recruited patients who were IOP lowering agents prior to surgery, whilst our study also recruited patients who were not on IOP lowering agents. This may have contributed to our qualified success rates being higher than the other two studies. Furthermore, the TNTG study[10] does not discuss the number of IOP lowering drugs used pre-operatively or post-operatively.

Oral acetazolamide was used in 9.1% of patients in our study. This rate is higher than that found in the NST study, while the rate was significantly lower than that found in the SESTS study. Furthermore, our patients were operated at a more advanced stage of glaucoma. This may explain why our unqualified success rates for the secondary outcome measure were lower than the comparative studies. The starting IOP was also higher in our cohort and this would contribute to the lower success rate for the secondary outcome.

Cohort selection as mentioned earlier may strongly impact the ability to compare results between studies. The TNTG study for instance only considered patients suffering from normal tension glaucoma. As a result, the pre-operative IOP and the post-operative IOP were destined to be lower. That being said, the post-operative change in IOP is also lower in the TNTG study. The lack of data on the number of pre-operative and post-operative IOP lowering drugs makes the comparison of secondary outcome measures between our cohort and the TNTG study impossible.

16.8% of patients in our cohort had complicated glaucoma. This compares closely to the 18% of cases in the SESTS study. Conversely, the NST study only included patients with POAG, PXF, PDS and NTG, whilst the TNTG study only considered patients with normal tension glaucoma, with a pre-operative IOP of <21mmHg. The Collaborative Bleb-Related Infection Incidence and Treatment Study (CBIITS)[7] on the other hand excluded patients with normal tension glaucoma and refractory glaucoma secondary to

neovascularization.

Conjunctival surgery is in itself a risk factor for failure of trabeculectomy surgery[5,11]. The NST study excluded patients who had previous surgery involving the bulbar conjunctiva. Our study only excluded patients that had previously undergone glaucoma surgery and not those patients whose surgery involved any disruption of conjunctival tissue. The TNTG study only excluded patients who had previously undergone combine cataract and filtration surgery. Furthermore, the CBIITS study included patients who had previously undergone filtration surgery.

A look at the complication rates within our study would show that early or late complications occurred in 66.7% of patients involved. Early complications were more common than late complications, occurring in 47.61% and 19.04% respectively (Table 1).

The rate of early complications compares favourably with 53.9% and 46.6% observed in the SESTS and NST studies respectively. It was postulated that the higher rate of early complications in the SESTS study may be due to the greater use of anti-metabolites compared to the NST study. This is also apparent in our study, with a higher rate of early complications when compared to the NST study, with 100% of patients within our cohort were given MMC during the procedure. The lower overall complication rate in the TNTG study may be pinned to the fact that all patients in the TNTG study cohort were cases of normal tension glaucoma. Hyphaema rate sin our study were higher than average. This may stem from the fact that our study cohort included a lot of patients suffering from diabetes mellitus. Furthermore, the CBIITS study makes it clear that neovascular glaucoma cases were excluded from the cohort.

Interestingly, hypotony was not so common amongst our complications, occurring in 9.52%. This is most likely due to the fact that adjustable sutures were used in our study and the TNTG study as part of the MSSS technique, as opposed to the conventional suture technique used in SESTS and NST. Adjustable sutures allow for tighter closure of the flap.[14] Furthermore, the use of a small sclerostomy punch and a fornix-based conjunctival flap help to further prevent hypotony.[15-17] Intra-operative hypotony is also reduced by the use of continuous intra-operative infusion .[18]

Also of note is the fact that no bleb leaks were reported in our study. This is a well documented early complication of trabeculectomy surgery. The answer may again lie in the technique adopted. By applying the MSSS, round-bodied needles are used as opposed to spatulated ones, allowing any conjunctival holes to close more spontaneously.[14]

Endophthalmitis was not noted in our study. This was not the case with the SESTS and NST study. It is possible that our cohort was not large enough to cater for the low incidence rate of endophtahlmitis. Furthermore, the positioning of the filtration bleb, which is ideally placed under the upper lid, coupled with the shift from limbus-based incisions to fornix-based incisions, dramatically reduces the rates of blebitis and endophthalmitis.[17]

Our study has several limitations. Firstly, the study is retrospective in nature, relying on case note documentation. The retrospective nature of the study did not allow for the adjustment of confounding factors such as age or sex. The sample size used in our study was relatively small. Demographic data of the qualified and unqualified success groups in both primary and secondary outcomes was not compiled. It is therefore difficult to attribute statistical significance to the results obtained.

A follow up of 1 year was chosen for pragmatic reasons, to be able to compare to the results obtained in the SETS and NTS studies. However, it is likely that success rate will decrease with longer follow-up. The TNTG study made use of a 4-year follow-up period, being able to assess the long-term impacts of filtration surgery using the MSSS approach. Our study could be further extended by another 3 years to assess whether the results obtained accurately compare to those within the TNTG study.

Measuring post-operative IOP was the only indicator of success or failure of filtration surgery in our cohort. The use of a single digit as a therapeutic aim for filtration surgery may be misleading. It may be worthwhile extending the follow-up period in our cohort and assessing outcomes and success in terms of the preservation of visual fields or the structural integrity of the optic nerve head and nerve fibre layer, as was undertaken in the TNTG study.[10,18]

Tube surgery has recently been implemented in the Maltese islands. A comparison study similar to the TVT study would prove to be beneficial and

could provide further knowledge on the differences that may exist in the safety and efficacy outcomes of both approaches[19] Furthermore, a four-year follow-up on the cohort used in this study would provide a lot of information on the long-term success and survival of trabeculectomy using MSSS here in Malta. Data will continue to be collected so as to monitor success rates over two and four year periods.

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An Unusual Cause for Fever: A Case Report on Microscopic Polyangiitis

Valentina Fenech, Norma Pavia, Michela Frendo

Abstract

Microscopic polyangiitis is a small-vessel vasculitis which results in pauci-immune necrotizing inflammation of blood vessel walls. In this report, we describe a case of microscopic polyangiitis in a 65-year old female who presented with a one month history of lower back pain followed by reduced appetite, weight loss and fever. An immunology screen detected perinuclear anti-neutrophil cytoplasmic antibodies with myeloperoxidase specificity in the serum. A renal biopsy was obtained because of mild proteinuria on urinalysis and revealed a small vessel vasculitis consistent with microscopic polyangiitis. She was started on treatment with glucocorticoids and cyclophosphamide which resulted in a positive clinical response, with resolution of fever and improvement in her inflammatory markers. Currently she is stable and since starting treatment, she has not had any relapses or flare ups.

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Keywords

Microscopic polyangiitis; Fever; Glucocorticoids; Cycyloposphamide

Introduction

Microscopic polyangiitis (MPA) is a rare condition associated with a significant burden of disease. Its non-specific presentation can represent a diagnostic challenge and lead to a delay in initiation of treatment. We report the case of a patient with MPA as an important clinical reminder to maintain a high index of suspicion in patients with persistent fever.

Case presentation

A 65-year old lady presented with a one month history of worsening exertional low back pain radiating to both lower limbs. There was no nocturnal pain or sphincter dysfunction. A Doppler Ultrasound of both lower limbs ruled out deep venous thrombosis and a Lumbosacral spine X-ray showed degenerative disc disease. The patient was diagnosed with mechanical back pain and discharged home on analgesia.

She presented again ten days later, with persistent low back pain together with myalgias in both of her calves. This time the pain was associated with reduced appetite and 2kg weight loss. She also had an on-going fever of up to $38.2^{O}C$ present since seven days.

She was otherwise hemodynamically stable and her physical examination was unremarkable. She had no rashes, no arthritis, no localised tenderness or focal neurological deficits.

Her past medical history included gastroesophageal reflux disease and hypothyroidism. She had no significant travel, social and family history.

Investigations

Initial investigations revealed a raised White cell count ($22.66x10^{9}/L$), Erythrocyte sediment rate (112mm1stHr) and C-reactive protein (125.9mg/L)

in-keeping with a marked inflammatory response. Haemoglobin was low (8.9g/dL) and haematinics showed low iron and folate stores. Urinalysis confirmed the presence of protein (25mg/dL) and erythrocytes (25mg/dL).

Infection was the primary suspected diagnosis. A Chest radiograph was taken and specimens of blood, urine and sputum were obtained and analysed for culture and sensitivity. Following this, the patient was started on empirical treatment with intravenous antibiotics.

However, the fever persisted and inflammatory markers remained elevated. A Computed Tomography scan of the Thorax, Abdomen and Pelvis was performed to assess for occult infection including abscess formation or malignancy. The scan was grossly normal except for mild thickening of the gastroesophageal junction. Malignancy was ruled out after a gastroscopy was normal. A transthoracic echocardiogram was also performed which did not reveal any vegetations.

Due to a progressive anaemia and persistent leucocytosis and thrombocytosis a diagnosis of myelodysplasia was considered. However, JAK2-V617F and BCR-ABL mutations were negative and a blood film showed only reactive-looking features. No monoclonal bands were detected on serum protein electrophoresis either.

On immunology screen, a high-titre of Myeloperoxidase-anti-neutrophil cytoplasmic antibodies (MPO-ANCA) (199.7U/mL) was detected, whilst other components of the immunology screen including Extractable nuclear antigen, Anti-nuclear antibody, Complement, Aldolase and Creatine kinase were normal. A viral screen was also negative.

In view of the history of proteinuria, a renal biopsy was obtained which confirmed the presence of a pauci-immune necrotizing small-vessel vasculitis. A total of twenty-five glomeruli were sampled and examined under light and electron microscopy (Figure 1 and 2). Indirect immunofluorescence was also used which demonstrated weak IgM-staining in mesangial areas whilst IgG, IgA and C3 were negative.

Figure 1: *Light microscopy of renal biopsy specimen*
Light microscopy of renal biopsy specimen which shows histopathological evidence of transmural fibrinoid necrosis of a small artery with sparing of glomerulus (Haematoxylin & eosin stain).

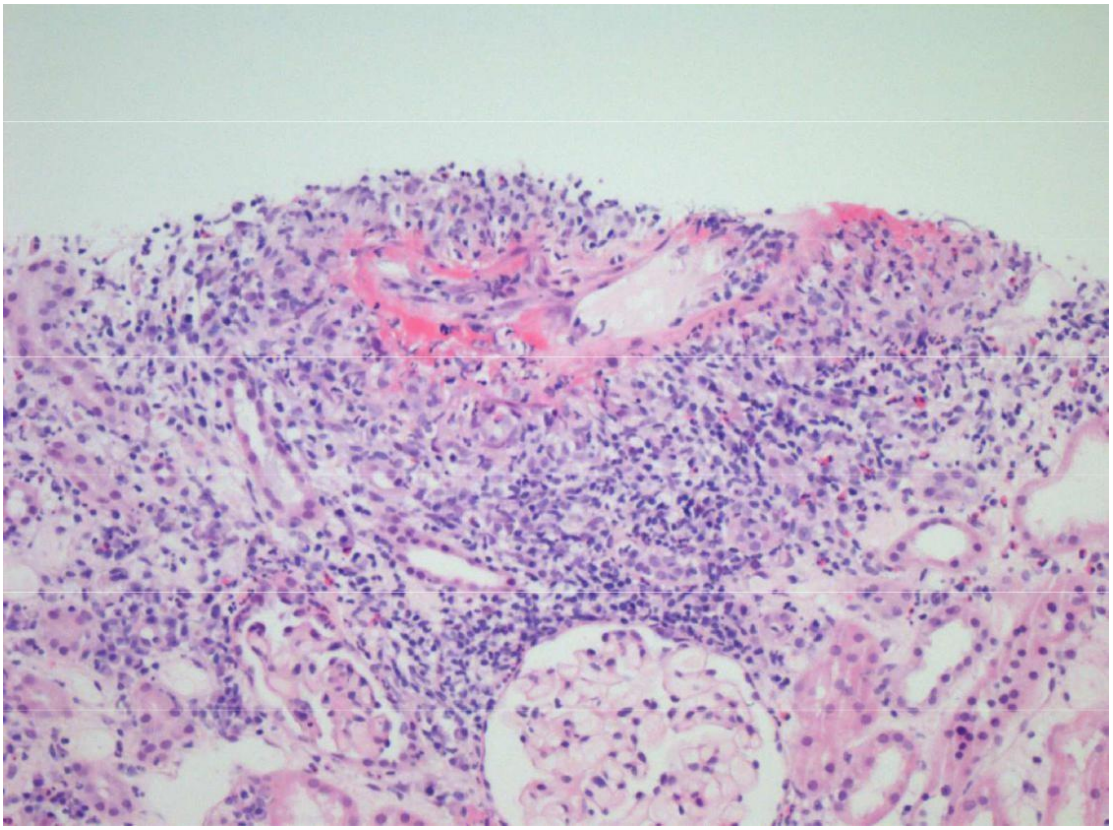
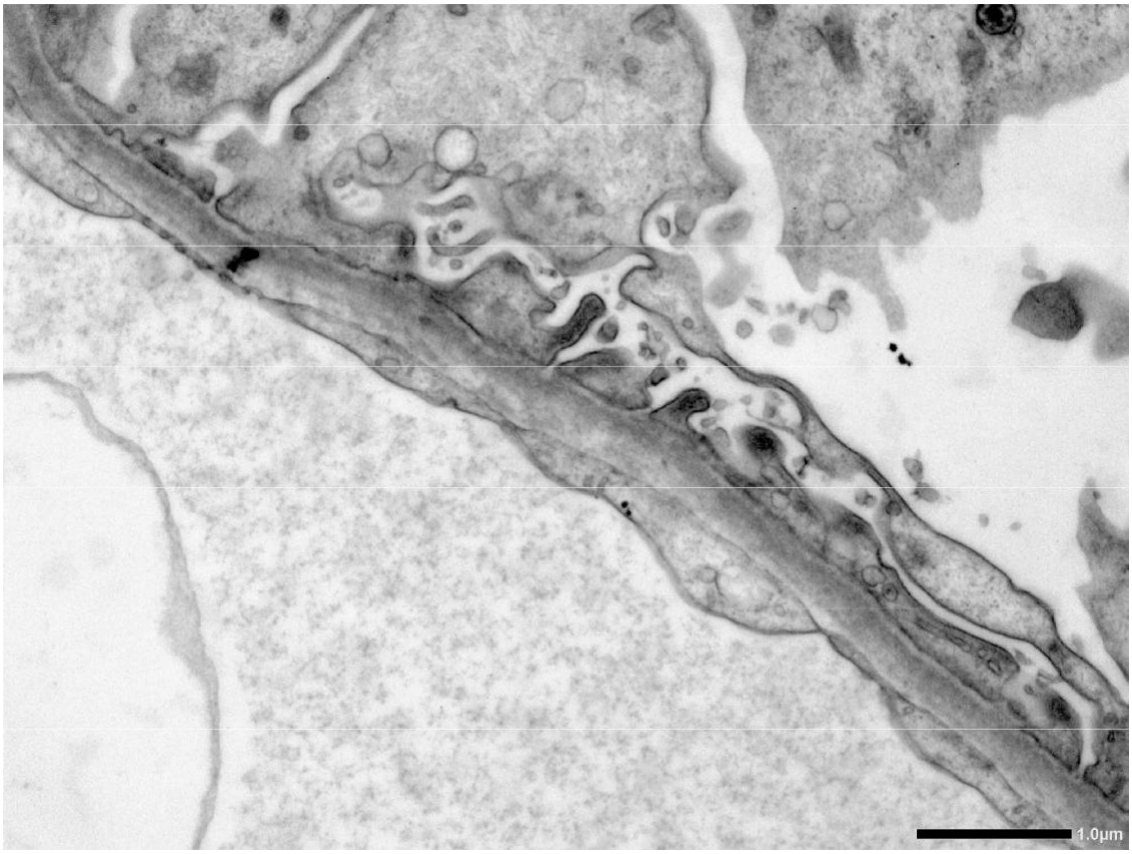


***Figure 2**: Electron microscopy of renal biopsy specimen*
Electron microscopy of renal biopsy specimen which shows mild endothelial swelling and loss of fenestrations. The basement membrane and podocyte layer are normal.



Treatment and Outcome

She received three pulses of intravenous methylprednisolone 500mg daily followed by a course of oral prednisolone at an initial dose of 1mg/kilogram/day (patient weighed 46kg) with good clinical effect. She was discharged on a tapering dose regime of oral prednisolone with calcium and vitamin D supplementation. She also underwent a Dual-energy X-ray absorptiometry scan with a view to starting bisphosphonate treatment after dental review and clearance.

Following education and counselling, she received intravenous cyclophosphamide (CP) with prophylactic co-trimoxazole and mercaptoethane sulfonate.

Since her diagnosis about one month ago, she is currently tailing off her steroids and undergoing treatment with 600mg of CP for a total of six doses.

Discussion

MPA is a MPO-ANCA-positive vasculitis which causes a pauci-immune necrotising inflammation of predominantly small blood vessels.[1]

The incidence of MPA in Europe ranges from 2.4 to 10.1 per million, whilst the prevalence ranges from 25.1 to 94 per million and shows an increase with age.[2]

MPA mainly presents with non-specific symptoms such as fever, myalgia, anorexia, weight loss and night sweats.[3] Therefore tissue-biopsy evidence of vasculitis is the gold standard for diagnosis.

MPA has the capacity to affect any organ but it has a predilection for the kidneys and lungs.[3] Renal manifestations include haematuria, proteinuria, red cell casts and focal segmental rapidly progressive glomerulonephritis.[3] The latter condition is life-threatening and leads to a rapid deterioration in glomerular filtration rate of at least 50% over weeks or days and extensive glomerular crescent formation.[3] Renal involvement in ANCA-associated vasculitis (AAV) has a worse prognosis in MPO-ANCA patients and glomerular sclerosis is associated with worse outcomes.[4-5]

The most important pulmonary manifestation of MPA is alveolar haemorrhage which occurs in about a third of MPA patients and it can be severe and life-threatening.[3]

New-onset organ-threatening or life-threatening disease is treated with glucocorticoids in combination with CP or rituximab (RX) which have similar efficacy profiles in induction of disease remission.[6] Pulse intravenous CP is preferred to daily oral CP as it results in a lower cumulative dose and is associated with less side-effects.[7]

Non-organ-threatening disease is treated with glucocorticoids in combination with methotrexate (MTX) or mycophenolate mofetil (MMF) whilst plasma exchange is reserved for patients with rapidly progressive renal failure or severe pulmonary haemorrhage.[6]

Disease remission should be maintained with a combination of low-dose glucocorticoids and immunosuppressive therapy which include azathioprine (AZA), RX, MTX and MMF.[6] The glucocorticoid-immunosuppressive treatment should be continued for a minimum length of 24 months and early cessation increases risk of relapse.[6]

AAV demonstrate a 2.7-fold increased mortality risk compared with the general population.[8] MPA long-term prognosis is less severe but relapses are frequent and can occur years after initial diagnosis.[9] The main factors affecting survival are age, renal involvement and burden of treatment.[9] Early diagnosis, treatment and prolonged follow-up are crucial to overcome the pitfalls related to MPA and improve patient outcomes.

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Case Report

Hyperglycaemic Hyperosmolar Non Ketotic Coma

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Abstract

A case report discussing the management of a patient with hyperosmolar hyperglycaemic state. This is intended to raise awareness about this complication of Type 2 diabetes and the factors that lead to it. HSS is mostly caused by severe dehydration and sepsis. Elderly patients often do not drink enough and infection is commonly seen in patients living in a hospitalised environment

Key Words

Dehydration, Sepsis, Hyperglycaemia, Hyperosmolar, Altered mental state, Ketones

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Overview

This case discusses a 75-year-old diabetic patient who suffered hyperosmolar hyperglycaemic state (HSS) previously known as hyperglycaemic hyperosmolar non-ketotic coma (HONK).

Introduction

HSS is a syndrome characterised by hyperosmolarity, hyperglycaemia and dehydration in the absence of ketoacidosis. Most cases are seen in elderly with type 2 diabetes. It is estimated to account for less than 1% of hospital admissions in patient with diabetes, *(Francisco J. Pasquel and Guillermo E. Umpierrez; 2014).*

Treatment of HSS include treating the underlying cause, replacing fluid loss and normalising blood glucose. It also aims to prevent complications such as arterial/ venous thrombosis and foot ulcers.

Case Presentation

History: Mrs D.V. is a 75 year old female, residing in a long term care facility. A proper history could not be obtained as she was a known case of dementia. Apart from dementia the patient also suffered from chronic heart failure, cerebral-vascular disease, type 2 diabetes mellitus, chronic kidney disease and hypertension. Nurses and health care workers noted her to be more lethargic and less responsive than usual.

Examination: No abnormalities were detected apart from an altered mental state. The patient was not in respiratory distress, parameters were stable and there was no obvious source of infection.

Investigations: Initial bloods showed that the patient had an acute kidney injury with rising urea and creatinine (see table) in addition to a septic picture with high white cell count and raised C reactive protein (see table). Mrs. D.V. was also noted to have increased capillary blood glucose.

Table 1: *Blood Results and Calculated Osmolality*

	Normal Values	Day 1	Day 2	Day 3	Day 3	Day 4	Day 5	Day 6	Day 7`	Day 8
WCC	4.3-11.4	17.99	14.56	17.29		12.55	9.96	8.83	8.31	7.59
CRP	0-5	49.7	102.5	253.5		250.7	236.5	225.8	122	46.9
UREA	1.7-8.3	42.6	41.2	43.6	37.3	32.1	24	21.5	11.4	3.3
CREAT	44-80	283	283	282	258	239	200	179	130	91
Na	135-145	171	172	162	153	154	146	148	138	140
K	3.5-5.1		4.54		3.41	3.79			3.98	4.36
Calc. Serum Osmolality	275-295	380								292

Management: She was started on intravenous (IV) fluids; 5% dextrose as the patient had hypernatraemia. (see table). Mrs. D.V was started on broad spectrum antibiotics (co-amoxiclav) as the source of infection was unknown. In view of the acute kidney injury, a catheter was also inserted to monitor urinary output. A urine sample was sent for culture but no organisms were cultivated. Ketones were not present in the urine.

The patient remained in a poor general condition and her inflammatory markers continued to rise in spite of the antibiotics. A Chest X ray was performed and showed congested lung fields but no consolidation. Therefore the source of infection was not yet found.

The addition of insulin to the dextrose infusion was not enough to control capillary blood glucose and so the patient was started on an intravenous insulin pump.

In spite all of this, Mrs D.V. continued to deteriorate. Antibiotics were switched from Co-amoxiclav to Tazobactam/Piperacillin. An ECG was performed which showed a 1st degree heart block. Blood tests showed further deterioration in renal function and increase in inflammatory markers. Blood cultures remained negative.

A differential diagnosis of HHS was made and patient was started on IV fluids twelve-hourly, as per NHS guidelines. Despite treatment with fluids, patient deteriorated. She was responsive only to pain the following day with a blood pressure of 90/70 mmHg and a pulse of 140 b/m. A bolus of 500 ml of intravenous fluids was given with minimal improvement. Relatives were contacted and informed about the poor prognosis. She was deemed not fit for CPR and an AOS (administration of sacraments) was done. Patient was started on oxygen and kept comfortable. IV fluids were increased to eight- hourly.

A microbiologist was contacted and informed about the case. He advised that the patient should be started on Meropenem. Repeated renal function tests showed low Potassium (due to the continuous infusion of Insulin), hence the patient was started on intravenous potassium supplement.

After increasing the fluids and using Meropenem the patient started to improve slowly. Parameters remained stable and blood results slowly improved back to normal. Capillary blood glucose was controlled and the patient could be weaned off the insulin pump. She was reviewed by the speech and language pathologist who started her on oral trials. When the patient started eating and drinking, IV fluids were stopped and catheter was removed.

Discussion

Hyperglycaemic Hyperosmolar State is a complication brought on by glucose levels more than 33mmol/L in patients with type 2 diabetes. Most commonly it occurs due to reduced fluid intake and infection is the most common preceding

illness.

According to NHS guidelines, diagnostic features include:

- high osmolality, often 320 mosmol/kg or more
- high blood glucose, usually 30 mmol/L or more
- severely dehydrated and unwell.

In HHS there is usually no significant ketosis/ketonaemia (less than 3 mmol/L), though a mild acidosis (pH greater than 7.3, bicarbonate greater than 15 mmol/L) may accompany the pre-renal failure.

Immediate management includes fluids usually 0.9% sodium chloride and finding the underlying cause for HSS. Underlying causes could be sepsis, or vascular events. Investigations such as blood glucose, osmolality, full blood count, chest X ray and ECG should be done. Control of blood glucose with insulin is of outmost importance however one should also avoid hypoglycaemia. Therefore, when blood glucose falls below 14 mmol/L 5% or 10% glucose should be commenced with the sodium chloride solution. Assessment for complications should be done throughout the management.

Mrs DV was severely dehydrated. One factor that may have led to this is the reduction in ability to drink water. As confirmed by the raised inflammatory markers there was also a source of infection. These 2 lead to the hyperosmolar hyperglycaemic state of the patient. Continuous follow up and appropriate management with fluids and antibiotics were critical for the wellbeing of the patient. Although the source of infection could not be elicited, the use of empirical antibiotics followed by the microbiology guided use of specific ones showed immediate results and was lifesaving to such a patient with frailty.

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