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Soft Tissue Sepsis Places a Massive Burden on Regional and Tertiary Surgical Services in KZN Province South Africa

Vincent Ehlers[1,2] · C. Kohler[1,2,3] · Natasha Di Rago[1,2] · Aida Tefera[4] · Elizabeth Lutge[4,5] · Damian Clarke[1,2,6]

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Abstract

Background Frequently, surgical intervention is needed to treat soft tissue sepsis (STS). Ideally, most STS should be managed at the lowest level of surgical care close to the patient's home and a well-functioning surgical service will be able to deliver this safely and effectively. This study interrogates the burden of STS in the province of KwaZulu-Natal and reviews at which level in the health system the operative management of STS is being dealt with.

Methods This study describes the operations for soft tissue sepsis conducted at all regional and tertiary hospitals in KwaZulu-Natal province for the period of 1 July to 31 December 2015. All procedures for soft tissue sepsis were identified for closer review.

Results Between 1 June and 31 December 2015, a total 6302 soft tissue-related procedures were performed in the regional and tertiary hospitals of KZN. The breakdown by anatomical region was as follows, 618 (9.8%) head and neck surgeries, 895 (14.2%) chest and back, 277 (4.4%) abdominal wall, 818 (13%) pelvis/perineal/buttock and 3070 (48.7%) extremity-related surgeries. There were a further 815 (12.9%) soft tissue-related procedures where the anatomical region was unspecified. Of the soft tissue procedures, 3943 (62.6%) were for the management of soft tissue sepsis. The anatomical regions involved included 316 (8%) head and neck, 485 (12.3%) chest and back, 194 (4.9%) abdominal wall, 589 (14.9%) pelvic, perineal and buttock, 2054 (52.1%) extremity and 365 unspecified operations. Peri-anal sepsis contributed 315 (8%), breast sepsis contributed to 372 (9.4%) of all soft tissue sepsis and amputations of extremities 658 (16.7%) of septic soft tissue procedures.

Conclusion There is a significant burden of soft tissue sepsis requiring surgical treatment each month at regional and tertiary hospitals in KZN. This is made up of breast sepsis, peri-anal sepsis and diabetic foot sepsis. This burden is being managed at an inappropriate level of care.

✉ Damian Clarke
nirusha.maharaj@kznhealth.gov.za;
http://www.kznhealth.gov.za

Aida Tefera
aida.tefera@kznhealth.gov.za

Elizabeth Lutge
elizabeth.lutge@kznhealth.gov.za;
http://www.kznhealth.gov.za

[1] Department of Surgery, Pietermaritzburg Metropolitan Hospitals Complex, Grey's Hospital, 201 Townbush Road, Private Bag X9001, Pietermaritzburg 3200, South Africa

[2] Department of Surgery, College of Health Sciences, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, Pietermaritzburg, KwaZulu-Natal, South Africa

[3] South African Global Surgery Society, Johannesburg, South Africa

Introduction

The Lancet Commission on Global Surgery (LCOGS) has highlighted the fact that although up to 15% of the global burden of disease is surgical, the vast majority of surgical operations are performed in the high-income countries of the world, whilst disproportionally few are performed in the low- and middle-income countries [1–5]. Whilst trauma and cancer-related diseases are major causes of surgically related morbidity and mortality globally, a number of benign conditions also contribute significantly to this global burden [6–11]. Some of these benign conditions are relatively easy to treat definitively, and successful and appropriate treatment will provide major beneficial effects economically and in terms of quality of life [6–11]. These benign conditions include acute abdominal emergencies as well as abdominal wall hernias and soft tissue sepsis [6–11]. Soft tissue sepsis (STS) refers to a spectrum of clinical entities with a heterogeneous presentation, cause and severity caused by microbial invasion of the skin and underlying soft tissues. STS has a spectrum ranging from mild life-threatening. In addition, the presence of comorbidities such as diabetes mellitus and AIDS can dramatically affect the course of STS, and a relatively minor infection may progress rapidly to present a significant threat to life and limb. Soft tissue sepsis can be managed with early antibiotic therapy, and if requiring surgery, should be managed at the level of care closest to the patient's place of origin. In South Africa, most soft tissue sepsis should be managed at the clinic or district hospital level [4, 5]. Previous work has, however, suggested that the district surgical system in KZN is not functioning appropriately [10–13]. The district institutions do not seem to be delivering the so-called Bellwether procedures (laparotomy and ORIF) in a meaningful capacity, and there is evidence that rural patients with acute appendicitis who present to district hospitals have worse outcomes than those who present directly to higher levels of care [10–13]. STS frequently requires surgical intervention. Ideally, most STS should be managed at the lowest level of surgical care close to the patient's home, and a well-functioning surgical service will be able to deliver this safely and effectively. This study interrogates the burden of STS in the province of KwaZulu-Natal and reviews at which level in the health system the operative management of STS is being dealt with. This project forms part of that overview of the surgical workload of the state sector of KwaZulu-Natal province. This particular paper reviews the province-wide burden of surgery for soft tissue sepsis managed at the regional and tertiary institutions in KZN over a 6-month period.

Clinical setting

KwaZulu-Natal province is situated on the eastern seaboard of South Africa and has an area of 94,361 km^2 and a population of just over 10 million people. It has a densely inhabited coastal area around the port city of Durban as well as a number of other urban conurbations namely Pietermaritzburg, in the midlands, the Ladysmith/Newcastle area in the north-west, and a large port at Richards Bay, 2 h north of Durban. However, about half of the population is rural and lives in districts with high poverty and inequality indices. There are 37 district hospitals: 12 regional hospitals, three tertiary hospitals and a single central quaternary centre in the province. Figure 1 is a map of KZN, and Table 1 lists all the tertiary and regional institutions in the province.

Ethics

The study was approved by the Biomedical Research Committee of the University of KwaZulu-Natal (reference: BE528/16) and by the KZN Health Research and Knowledge Management Unit (reference: KZ_2016RP21_975). In an attempt to calculate the general surgical burden of KwaZulu-Natal, data were collected from a total of 16 regional and tertiary facilities from across the province.

Methods

This study describes the operations for STS conducted at the 10 regional, and 3 tertiary hospitals with a general surgical service KwaZulu-Natal province for the period of 1 July to 31 December 2015. Data were submitted from the facility information officer at each hospital in the province to the knowledge and epidemiology unit. The data were captured from operating theatre registers for this period. The variables collected included: the district in which the hospital is placed, the name of the operation, the date of the operation and the indication or outcome of operation if available. The raw data were entered into an excel database

[4] Epidemiology Unit, KZN Department of Health, Natalia 330 Langalibalele (Longmarket) Street Pietermaritzburg 3201, P/Bag X9051, Pietermaritzburg 3200, South Africa

[5] School of Nursing and Public Health, University of KwaZulu-Natal, Mazisi Kunene Road, Glenwood, Durban 4041, South Africa

[6] Department of Surgery, University of the Witwatersrand, Johannesburg, South Africa

and then analysed by the primary authors. A soft tissue sepsis-related procedure was defined as an operation to the soft tissues of the body not involving bony tissue or tendons. Soft tissue sepsis-related procedures included: incision and drainage of an abscess, excision of a carbuncle, tissue debridement and an extremity amputation for sepsis. The following body regions were used to classify soft tissue sepsis-related procedures, head and neck (H&N), chest and back (C&B), abdominal wall, pelvis/perineal/buttock and extremity related surgeries. All data were further classified according to the following specifiers: peri-anal sepsis, breast sepsis and amputations. The peri-anal sepsis category was restricted to procedures that directly specified the term "peri-anal", excluding any other pelvic- or buttock-related sepsis. In situations where it was unclear from the data as to the nature of the operation, a Delphi discussion was held to define the most likely scenario. The operative output of the 37 district hospitals in the province has been previously analysed, and this data was revisited to develop a denominator for all soft tissue sepsis managed in the province for the period under review [12]. The emergency/elective (Ee) ratio was calculated by dividing the number of emergent surgeries by the number of elective surgeries and multiplying by 100. This indicates the number of emergency procedures performed per 100 elective procedures performed [14].

Results

Between 1 June and 31 December 2015, there were a total of 20,462 procedures conducted in regional and tertiary hospitals within KZN. In an effort to streamline the classification of data, we removed those procedures usually carried out by specialist surgical disciplines (obstetrics, gynaecology, orthopaedics, plastics, ENT, maxillofacial, paediatric surgery, ophthalmology, neurosurgery, vascular and urology) to focus on conditions usually managed by the general surgeon within a South African context. The records that had unintelligible data capture errors were also removed. A total number of 13,282 records remained. Out of this number, 4580 (34.5%) were elective operations, 7777 (58.6%) were emergency operations and 925 (6.9%) were trauma-related operations. The ratio of emergency to elective procedures (Ee) was 169. The anatomical sites of operation were described where possible: head and neck: 987; chest and back: 1031; extremity 3154; pelvic/perineal/buttock: 991; abdominal: 5630 and unspecified: 1928.

District hospitals

There were a total of 18,871 operations performed at 37 district hospitals in KwaZulu-Natal from July to December 2015. Of this, a total of 2252 general surgical operations were performed. These included 232 laparotomies and 2020 "minor" procedures which include excision of soft issue lesions biopsies and drainage of soft tissue infection.

Soft tissue sepsis

A total 6302 soft tissue-related procedures were performed during the 6-month period under review. The breakdown by anatomical region was as follows: 618 (9.8%) head and neck (H&N) surgeries, 895 (14.2%) chest and back (C&B), 277 (4.4%) abdominal wall, 818 (13%) pelvis/perineal/buttock (PPB) and 3070 (48.7%) extremity-related surgeries. There were a further 815 (12.9%) soft tissue-related procedures where the anatomical region was unspecified. Figure 2 shows this breakdown. Of the soft tissue procedures, 3943 (62.6%) were for the management of soft tissue sepsis. The anatomical regions involved included 316 (8%) head and neck, 485 (12.3%) chest and back, 194 (4.9%) abdominal wall, 589 (14.9%) pelvic, perineal and buttock, 2054 (52.1%) extremity and 365 unspecified operations. Numerous procedures addressed sepsis in multiple regions leading to a degree of overlap. Of 316 H&N procedures, there was an overlap of 12 (3.8%) procedures with other anatomical regions; of 485 C&B procedures, there was an overlap with 27 (5.6%) other regions. Of 194 abdominal procedures, there was an overlap in 22 (11.3%) cases with other regions; of 589 PPB anatomical overlap in 27 (4.6%) cases and of 2054 extremity procedures, there was an overlap of 42 (2.4%) other anatomical regions. Peri-anal sepsis contributed 315 (8%) cases, breast sepsis contributed to 372 (9.4%) cases of all soft tissue sepsis, and amputations of extremities 658 (16.7%) cases. There were 482 cases of soft tissue debridement and 128 carbuncle excisions. The remainder of the procedures included incision and drainage, excision of suppurative hidradenitis and a combination of drainage and debridement. Figure 3 attempts to show the type of procedures undertaken. Based on these figures, each institution will perform 54 operations for soft tissue sepsis each month and 9 major amputations a month. There are 657 procedures for soft tissue sepsis each month across the province. There are 7673 hospital beds across the regional and tertiary institutions. This implies that each month eight percent of regional and tertiary hospital beds are occupied by patients requiring surgery for soft tissue sepsis. Using the previously published data on the operative output of the district institutions in the province, a total of 2020 "minor procedures" were performed, suggesting that the volume of soft tissue sepsis managed at the regional and tertiary institutions was in the magnitude of three times that managed in the district institutions.


Mozambique
Swaziland
Mpumalanga
Free State
Lesotho
Eastern Cape
Indian Ocean
Amajuba
Zululand
Umkhanyakude
Uthukela
Umzinyathi
Uthungulu
iLembe
UMgungundlovu
eThekwini
Harry Gwala
Ugu
AREA 2
NEWCASTLE
VRYHEID
DUNDEE
NQUTU
LADYSMITH
TUGELA FERRY
ESTCOURT
GREYTOWN
MONTEBELLO
PIETERMARITZBURG
RICHMOND
CREIGHTON
IXOPO
MATATIELE
KOKSTAD
INGWAVUMA
PONGOLA
JOZINI
PAULPIETERSBURG
NGOME
NONGOMA
HLUHLUWE
HLABISA
ULUNDI
MELMOTH
NTAMBANANA
EMPANGENI
RICHARDS BAY
ESHOWE
STANGER
DURBAN
SCOTTBURGH
PORT SHEPSTONE
MARGATE
PORT EDWARD
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The GIS Unit
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◀**Fig. 1** Map of KwaZulu-Natal province broken down into health care districts

Table 1 List of regional and tertiary hospitals in the KZN province with total number of beds. Source: KZN Department of health website

Name of hospital	Level	Beds $N = 7673$
Greys	Tertiary	530
Ngwelezane	Tertiary	550
King Edward	Tertiary	799
Addington	Regional/secondary	571
Edendale	Regional/secondary	874
Stanger	Regional/secondary	466
Ladysmith	Regional/secondary	452
Madadeni	Regional/secondary	1107
Newcastle	Regional/secondary	248
Port Shepstone	Regional/secondary	333
Prince Mshiyeni	Regional/secondary	1200
RK Khan	Regional/secondary	543

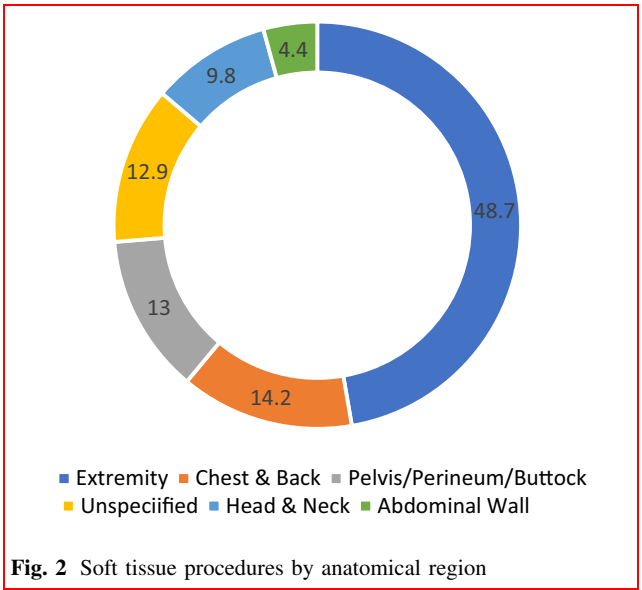

Fig. 2 Soft tissue procedures by anatomical region

Discussion

It has been estimated that in 2010, there were 896,000 deaths, 20 million years of life lost and 25 million disability-adjusted life-years from a cohort of eleven emergency general surgical conditions [1, 2, 5–8]. According to this report, the most common causes of death in order of magnitude were complicated peptic ulcer disease, aortic aneurysm, bowel obstruction, biliary disease, mesenteric ischaemia, peripheral vascular disease, soft tissue sepsis and acute appendicitis [8]. Since this seminal publication, little has been reported on the soft tissue sepsis in South Africa and there has been no attempt to quantify the burden of this problem.

The three most well defined types of STS include peri-anal sepsis, breast sepsis and diabetic-related limb sepsis [9]. Breast sepsis is mostly related to lactation. Appropriate early antibiotic usage and ultrasound-guided drainage may allow for lactational breast abscesses to be treated non-operatively. Peri-anal sepsis is complex to manage and may result in significant morbidity if neglected. There is a major burden of diabetic-related foot sepsis in the province and that is reflected by the large number of extremity amputations undertaken across the province. An average of 100 major amputations are undertaken each month. This reflects the emerging epidemic of cardiovascular disease in the province. Ongoing urbanization and the widespread adoption of high fat low-fibre-type diets has been associated with a burgeoning problem of diabetes. Lack of access to appropriate diabetic health care facilities especially podiatry services and preventative services translates into this high rate of amputations.

With just under 657 procedures for soft tissue sepsis being performed each month in KZN, there is a significant burden of soft tissue sepsis requiring surgery. These range from relatively minor operations to major procedures such as amputations and affect a wide spectrum of body regions. This translates into 50 operations for soft tissue sepsis each month at each of the regional or tertiary hospitals included. This cascades into a significant demand for resources such as access to operating rooms, anaesthesia and hospital beds across the regional and tertiary institutions [12–14]. There are data to suggest that the district level hospitals in KZN are failing to deliver the appropriate level of surgical care. Consequently, district level surgical pathology is transferred to higher levels of care. This burden then competes for resources with patients requiring more advanced or complex surgery. It would appear that the ratio of emergency to elective surgery in KZN is skewed towards emergency work, and this reflects an over-burdened service with a failing primary health care system [12–16].

This paper has implications for the development and roll out of surgical services in LMIC's. Barriers to access to care translate into a high incidence of STS requiring surgery. Delayed review and delayed commencement of antibiotics means that minor infections go on to develop into STS which requires surgery. This is especially applicable to lactational breast abscesses and possibly peri-anal sepsis. Poor access to preventative diabetic foot care services translates into a high need for major amputation. Appropriate and effective primary health care services should reduce the need for surgery for STS. When surgery

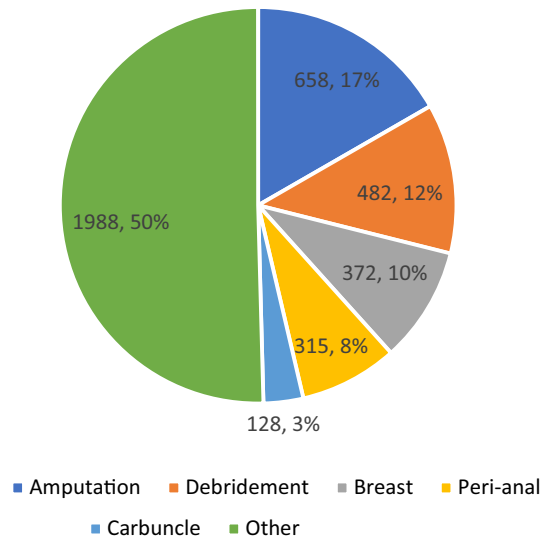

Fig. 3 Procedures for soft tissue sepsis

is required, it should be possible to deliver this at the district level of care.

Conclusion

There is a significant burden of soft tissue sepsis requiring surgical treatment each month in KZN. This is made up of breast sepsis, peri-anal sepsis and diabetic foot sepsis. This burden appears to be managed at an inappropriate level of care.

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Compliance with ethical standards

Conflicts of interest The authors have no conflicts of interest to declare.

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Dr. Vincent Ehlers Dr. Vincent Ehlers is a graduate of the University of the Witwatersrand, South Africa. He obtained his medical degree in 2017 graduating on the Dean's List and winning the AE Wilkinson medal for the top clinical surgical student. Dr. Ehlers is an aspiring young surgeon with a passion for research and patient care driven by the goal of improving the quality and access to healthcare in the state sector of South Africa. He has a special interest in reconstructive surgery and wound healing which he plans to pursue in the future. He is currently employed in the Department of Surgery at Sebokeng Regional Hospital in the Gauteng province and looking to enter a surgical registrar post in 2021.