Clinical innovation: the Sandy Grading System for Surgical Wound Dehiscence Classification — a new taxonomy

Author:
Kylie Sandy-Hodgetts

The worldwide volume of surgery is considerable, with an estimated 234.2mn major surgical procedures carried out every year (Weiser et al, 2008). While contemporary surgical procedures are relatively safe, complications such as surgical wound dehiscence, although not commonplace, are a major disruptor to patient wellbeing and wound healing outcomes. Moreover, the importance of classification, documentation and reporting of this type of wound must not be underestimated. Accurate diagnosis and reporting of the type of dehiscence and underlying aetiology is key to understanding the extent of the problem. This paper presents a novel classification system that uses a systematic approach for the diagnosis of the type of dehiscence following surgery.

Surgical wound dehiscence (SWD) is one of the more serious postoperative wound complications impacting patient morbidity and mortality following surgery (Waqar et al, 2005; Spiliotis et al, 2009), and may occur regardless of the type of surgical procedure. The most commonly used definition and reporting system for SWD is as a deep surgical site infection, coined under the Centre for Disease Control and Prevention (CDC) definition for surgical site infection (SSI) (Horan and Dudeck, 2008) *[Table 1]*. While there are specific criteria in relation to deep SSI, this is directly related to the presence of infection in the wound, regardless of other non-microbial causes related to SWD.

Moreover, this current system provides limited wound-related diagnostic information for clinicians, especially if non-microbial forces are at play, such as pre-existing chronic disease or mechanical factors, such as increased lateral tension on the incision due to obesity. While the occurrence of SWD is most commonly reported between day 7–9 in the postoperative period (Ridderstolpe et al, 2001; van Ramshorst et al, 2010), the wound is often managed in the post-discharge setting, with limited published reports of the costs associated with clinical management of this problem (Tanner et al, 2009; Sandy-Hodgetts et al, 2016).

Currently, there is a dearth of evidence globally on the prevalence and incidence of SWD unrelated to wound infection. The reasons may be multifactorial; the lack of a standard definition for SWD, an appropriate grading system for accurate diagnosis, or post-discharge surveillance reporting. Although a number of authors have emphasised the need to correctly identify postoperative wound complications and improve post-discharge surveillance (Spiliotis et al, 2009; Tanner et al, 2009; Leaper et al, 2013; Tanner et al, 2013; Sandy-Hodgetts et al, 2016), until now, the only widely accepted taxonomy for classification of SWD is the CDC SSI definition *[Table 1]*.

The CDC definition is the most widely used system globally when reporting SSIs following surgery, with no parameters for incisional dehiscence that is unrelated to infection and attributable to non-microbial causes that are known factors in delayed healing, such as obesity (Ridderstolpe et al, 2001; Wilson and Clark, 2004; Williams et al, 2009; Giordano et al, 2017), diabetes (Kao and Phatak, 2013), poor nutrition (Stechmiller, 2010; Varadhan et al, 2010; Lv et al, 2012) or chronic disease (Paletta et al, 2000; Gao et al, 2003; Heikkinen et al, 2005; Celik et al, 2011, Floros et al, 2011).

A critical issue remains — what are clinicians to use as a classification system for wound dehiscence when infection is not the underlying cause? This paper introduces the first stage of the development of an internationally recognised grading system for SWD, a new taxonomy that

Kylie Sandy-Hodgetts BSc MBA (PhD Scholar) MAICD *is Adjunct Research Fellow, School of Human Sciences, University of Western Australia and Clinical Trials Coordinator Ramsay Health Care, Joondalup, Australia*

Table 1. CDC/NHSN surveillance definition of healthcare-associated infection and criteria for specific types of infections in the acute care setting (Horan, 2013).

SIP/SIS-Superficial incisional surgical site infection (SSI) Superficial incisional SSI must meet the following criterion: infection occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date), including those coded as 'OTH'* *and* involves only skin and subcutaneous tissue of the incision and patient has at least one of the following: a. purulent drainage from the superficial incision b. organisms isolated from an aseptically-obtained culture of fluid or tissue from the superficial incision c. superficial incision that is deliberately opened by a surgeon, attending physician** or other designee and is culture-positive or not cultured *and* patient has at least one of the following signs or symptoms of infection: pain or tenderness; localised swelling; redness; or heat. A culture negative finding does not meet this criterion d. diagnosis of superficial incisional SSI by the surgeon or attending physician** or other designee (see reporting instructions). *http://www.cdc.gov/nhsn/XLS/ICD-9-cmCODEScurrent.xlsx ** The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant). **Comments** There are two specific types of superficial incisional SSIs: 1. Superficial Incisional Primary (SIP) — a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB) 2. Superficial Incisional Secondary (SIS) — a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB).	**Organ/space SSI** Organ/Space SSI must meet the following criterion: infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) *and* infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure *and* patient has at least one of the following: a. purulent drainage from a drain that is placed into the organ/space b. organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space c. an abscess or other evidence of infection involving the organ/space that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test *and* meets at least one criterion for a specific organ/space infection. **Comments** Because an organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure, the criterion for infection at these body sites must be met in addition to the organ/space SSI criteria. For example, an appendectomy with subsequent subdiaphragmatic abscess would be reported as an organ/space SSI at the intra-abdominal specific site (SSI-IAB) when both organ/space SSI and IAB criteria are met.

incorporates both the microbial and non-microbial aspects of SWD and proposes a level grading system with an anatomical approach.

Overview

Following a narrative review of the literature (Sandy-Hodgetts et al, 2015), a distinct absence was identified in the clinician's armamentarium of a consensus-derived definition and grading system for SWD. Discrepancies in the use of appropriate definitions in wound care often provide discourse in the literature (Lazarus et al, 1994; Wilson et al, 2004) (Leaper et al, 2004; 2013), with SWD receiving little attention among other wound types. Moreover, there is no consensus derived and validated grading system for clinicians to use in the diagnosis, recording and reporting of SWD. Consensus

Table 2. The Sandy Grading System for Surgical Wound Dehiscence.

Grade	Descriptor
I	Minor separation of opposed incisional margins at any point along the incision, <2cm depth. No visible subcutaneous layer. No clinical signs and symptoms of or microbiological confirmation of infection.*
Ia	As above with clinical signs and symptoms and/or confirmed microbiological confirmation of infection.*
II	Medium (single or multiple) separations of opposed incisional margins to expose subcutaneous layer, >5 cm depth. Bridging or tunnelling of dehiscence evident.*
IIa	As above with clinical signs and symptoms and/or confirmed microbiological confirmation of infection.*
III	Major (single of multiple) separation of the incisional margins to expose subcutaneous, fascial/ muscle/tendons and or organs.*
IIIa	As above with clinical signs and symptoms and/or confirmed microbiological confirmation of infection.*

*Up to and including day 30 postoperative period.

has been an effective framework for the development of international guidelines for pressure injuries (National Pressure Ulcer Advisory Panel [NPUAP], 1989), development of the STAR skin tear classification system (Carville et al, 2007) and burn injuries (Greenhalgh et al, 2007). The use of an internationally accepted common definition and grading system for SWD is required to facilitate best practice and research within this domain. The Sandy Grading System for SWD *[Table 2]*, describes a new grading system related to the incisional wound dehiscence characteristics and is determined by the visible anatomical features at the incision site. It is intended that this grading system can provide a suitable preliminary diagnostic tool for enhanced clinical decision making and inform strategies in clinical management.

Future Direction

A proposed Sandy Grading System for SWD is anatomically focussed and incorporates both microbial and non-microbial presentation of SWD. It provides the clinician with relevant anatomical descriptors, which can be used to diagnose the type and extent of the wound dehiscence. With further development it will be feasible to incorporate relevant clinical prognostic signs into this new grading system to inform clinical practice. It should be recognised that while this new grading system is based on current evidence, it awaits peer review and clinical validation. It is critical for the SWD grading system to be applicable to the clinical setting with very high inter-rater reliability for maximum clinical impact and the subsequent improved patient outcomes. WINT

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