

Open Chest Duration Following Congenital Cardiac Surgery Increases Risk for Surgical Site Infection

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OBJECTIVES: Surgical site infections (SSI) following congenital heart surgery (CHS) remain a significant source of morbidity and mortality with an estimated incidence of 11%. Delayed sternal closure (DSC) is often required within the pediatric population to minimize the potential for postoperative respiratory and hemodynamic instability. While repeated open chest procedures and extracorporeal membrane oxygenation have been identified as independent risk factors for SSI following DSC, the effect of open chest duration following the primary surgery remains less well defined. Thus, the purpose of this study was to evaluate the incidences of SSI among patients with DSC versus primary closure (PCC) and to concomitantly evaluate the effect of open chest duration on SSI occurrence.

METHODS: A retrospective review of our institutional Society of Thoracic Surgeons dataset was performed to identify patients undergoing CHS at our institution between 2015 and 2020. Patients with SSI were identified within a prospectively collected institutional dataset and matched accordingly. Incidences of SSI were compared between DSC patients and patients undergoing PCC utilizing bivariate analysis. Further, patients with DSC were evaluated to determine the association of open chest duration on the incidence of SSI.

RESULTS: 2582 operations were performed in 2492 patients with congenital heart disease at our institution between 2015-2020, including 195 DSC cases and 2387 PCC cases. The incidence of SSI within the cohort was 1.8% (n=47). DSC patients had significantly higher incidences of SSI (8.7%) than PCC patients (1.3%, p=0.041, OR:6.7). Within the DSC cohort, patients that went on to develop SSI had a longer open chest duration (mean=24.7 days, SEM=10.2 days) when compared to non-SSI DSC patients (mean=6.4 days, SEM=0.71 days).

CONCLUSIONS: SSI remains a significant source of morbidity following congenital cardiac surgery. The incidence of SSI is higher in patients undergoing delayed sternal closure compared to patients with primary chest closure. Further, prolonged open chest duration presents a potentially modifiable risk factor for SSI predisposition. These data support dedicated, daily post-operative assessment of candidacy for chest closure to minimize the risk of SSI.

Table 1. Patient characteristics for 177 delayed sternal closure (DSC) patients with SSI vs non-SSI

Patient characteristics	SSI (n=17)[#]	Non-SSI (n=160)[#]	P value[†]
Age	0.15±0.21	0.71±2.7	0.386
Female Gender	10 (58.5%)	69 (43.1%)	0.216
Weight (kg)	3.6±1.7	5.3±8.6	0.426
Race/Ethnicity	N (%)	N (%)	
Caucasian	2 (11.8)	72 (45)	0.017
Black	1 (5.9)	6 (3.8)	0.668
Hispanic	9 (52.9)	47 (29.4)	0.087
Other	5 (29.4)	35 (21.9)	0.480

[#] Categorical variables are expressed as N (%). Continuous variables are expressed as mean with standard deviation.

[†] P values less than 0.05 are bolded.

Abbreviations: kg, kilograms.

Table 2. Operative details for 177 delayed sternal closure (DSC) patients with SSI vs non-SSI

Operative characteristics	SSI (n=17)[#]	Non-SSI (n=160)[#]	P value[†]
Norwood procedure	4 (23.5)	45 (28.1)	0.687
TAPVC	3 (17.6)	12 (7.50)	0.153
Aortic arch repair	2 (11.8)	2 (1.25)	0.005

[#] Categorical variables are expressed as N (%). Continuous variables are expressed as mean with standard deviation.

[†] P values less than 0.05 are bolded.

Abbreviations: TAPVC, total anomalous pulmonary venous connection.

Table 3. Outcomes for 177 delayed sternal closure (DSC) patients with SSI vs non-SSI

Outcomes	SSI (n=17)[#]	Non-SSI (n=160)[#]	P value[†]
Open chest duration	14.2±16.2	4.31±4.86	0.024
Postoperative mortality	2 (11.8)	26 (16.3)	0.630

[#] Categorical variables are expressed as N (%). Continuous variables are expressed as mean with standard deviation.

[†] P values less than 0.05 are bolded.