



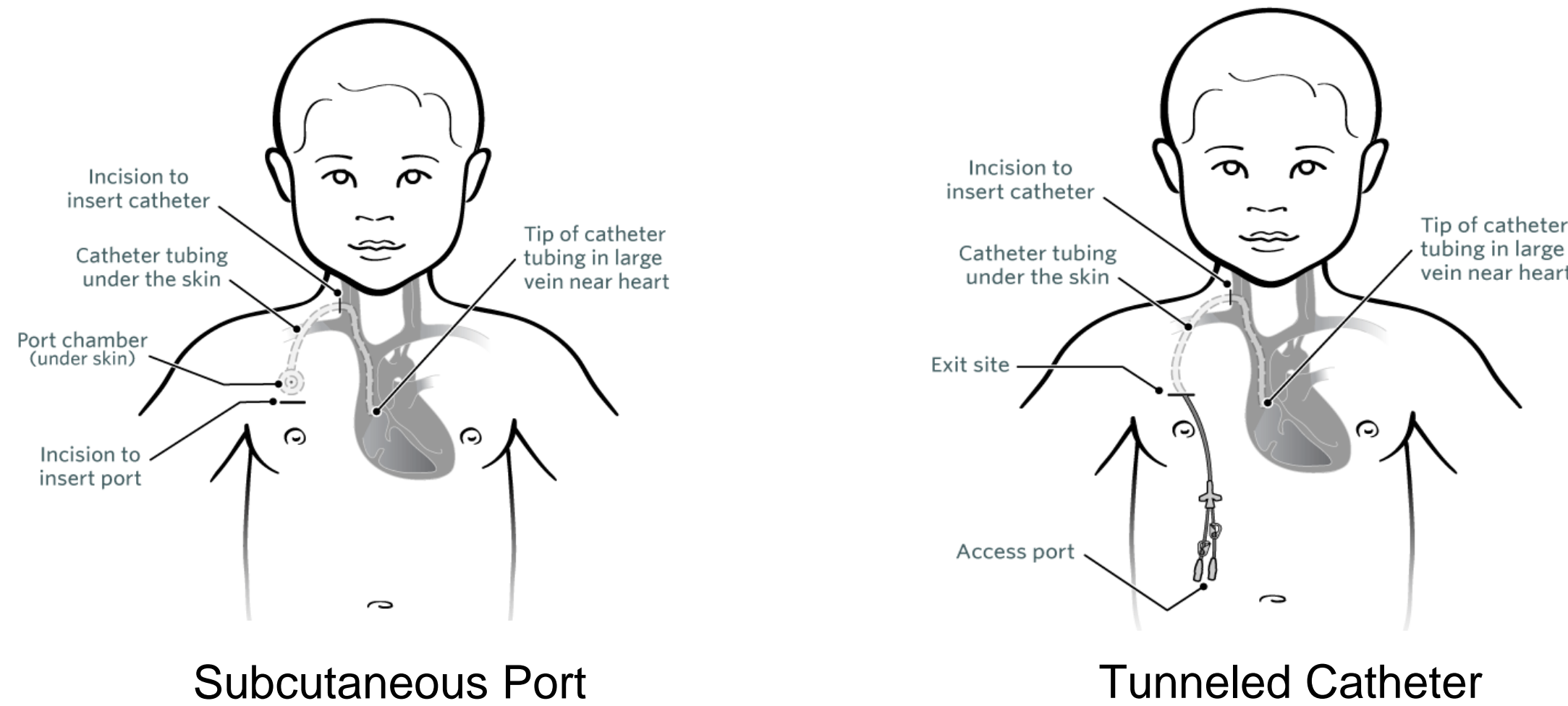
Long Term Central Venous Access in a Pediatric Leukemia Population



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Introduction

- Acute leukemia accounts for nearly 1/3 of all childhood cancers
- In leukemia, immature blood cells uncontrollably proliferate in the bone marrow and interfere with normal blood cell development
- There are two forms of acute leukemia, acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL)
- A central venous access device (CVAD) is commonly used for vascular access
- Our study involved two CVAD types: a subcutaneous port or a tunneled catheter



- However, the use of CVADs comes with peri-operative and long-term complications
- The rates of CVAD associated complications have not been identified in the pediatric acute leukemia population
- Our aim was to retrospectively analyze the complication rates among pediatric acute leukemia patients at a single pediatric tertiary referral center

Methods

- We conducted an IRB approved retrospective analysis of all patients with diagnosis of ALL or AML admitted to our institution from May 2009 to July 2014.
- Demographic data** included: gender, age at diagnosis, height, weight, ethnicity, race, and financial class. Weight status was categorized as underweight, normal, overweight, obese, or infant (<2 yrs old)
- Patient specific data** included: vitals at diagnosis, complete blood count at diagnosis and before surgery, diagnosis (AML/mixed phenotype or ALL), number of days from diagnosis until treatment initiation and surgery, and chemotherapy regimen
- Surgery specific data** included: surgeon, amount of blood products received, CVAD type (subcutaneous port or tunneled catheter), location of central access and port reservoir, patient positioning, catheter size, imaging by fluoroscopy or ultrasound, and any other associated procedures
- Peri-operative complications** (≤ 24 hours of surgery) included: pneumothorax, hematoma, hemothorax, arterial puncture, catheter malpositioning, and air embolism
- Long-term complications** (>24 hours after surgery) included: deep venous thrombosis (DVT), line-associated infection (blood stream and/or port site infection), line malfunctions (poor drawback or forward flush, fibrin sheath, and breaks), and tPA administration
- Chi square, t-tests, and backward stepwise multivariate-regression were used for statistical evaluation
- Statistical significance $p < 0.05$

Results

- 198 patients were diagnosed with either ALL or AML/mixed phenotype
 - The 168 ALL patients (55% male) ranged in age from 0.4 to 18.7 years old (mean \pm SD: 6.2 \pm 4.4)
 - The 30 AML/mixed phenotype patients (50% male) ranged in age from 0.3 to 17.5 years old (mean \pm SD: 5.4 \pm 5.3)
- Eight (4%) patients were underweight, 107 (54%) were normal, 16 (8%) were overweight, 32 (16%) were obese, and 35 (18%) were under 2 years old
- A total of 292 CVADs were placed in the 198 patients: 240 were subcutaneous ports and 52 were tunneled catheters
 - ALL patients had a mean of 1.4 total lines placed
 - AML patients had a mean of 2.1 total lines placed

Peri-operative Complications:

Complication	Port (%)	Tunneled Catheter (%)	p
Hematoma	2 (0.8%)	1 (1.9%)	0.48
Hemothorax	0	1 (1.9%)	0.03
Arterial Puncture	2 (0.8%)	1 (1.9%)	0.48
Catheter Malposition	9 (3.8%)	1 (1.9%)	0.50
Total	4	13	-

Table 1: Peri-Operative Complications by Line Type

- Univariate analysis identified younger age as a risk factor for a hematoma ($p=0.02$)

Long-Term Complications:

- Only 23 (7.9%) lines did not have any long-term complications
- 232 lines (79.4%) required at least 1 dose of tPA
- Subcutaneous ports and tunneled catheters had similar rates of long-term complications

Complication	Port (%)	Tunneled Catheter (%)	p
Venous Thrombosis	4 (1.7%)	2 (3.9%)	0.31
Line Malfunction	117 (48.75%)	19 (36.5%)	0.10
Blood Stream Infection	19 (7.9%)	3 (5.8%)	0.59
Insertion Site Infection	7 (2.9%)	2 (3.9%)	0.73
Premature Removal	58 (24.17%)	17 (32.69%)	0.20
Total	205	43	-

Table 2: Long-Term Complications by Line Type

- Univariate analysis identified weight status as a risk factor for blood stream infection ($p=0.02$), DVT ($p=0.009$), line malfunction ($p=0.02$), and premature removal ($p=0.02$)

Results (cont.)

- Stepwise multivariate linear regression identified the following:

Odds of Early Line Removal	OR (95% CI)
Non-Hispanic Ethnicity	0.91 (0.82 - 1.02)
Obesity	1.27 (1.10 - 1.48)
# of Days from Diagnosis to Line Placement	1.0 (1.0 - 1.0)
Location of Central Access: Left Internal Jugular	1.34 (0.91 - 1.95)
Position of Port: Below the Nipple Line	1.01 (0.90 - 1.13)
Catheter Size	0.92 (0.85 - 0.99)
Blood Stream Infection	2.41 (1.95 - 2.98)
Port Site Infection	2.68 (1.89 - 3.80)
Line Malfunction	1.18 (1.04-1.33)

Table 3: Risk Factors for Early Catheter Removal (adjusted $R^2=0.463$)

Conclusion

- Peri-operative complications at our facility are few and consistent with reported rates of CVAD placement in patients in other institutions
- Increased weight correlated with an increased risk for a DVT, line-associated blood stream infection, line malfunction, and premature removal
- Multivariate analysis demonstrated obesity, and presence of a blood stream or insertion site infection, and insertion into the left subclavian vein as the greatest risk factors for premature CVAD removal
- In contrast to previous studies, our data assert that there is no significant difference in complication rates between ports and tunneled catheters
- Long-term complications are much more prevalent than peri-operative complications and can lead to catheter replacement, premature removal, or additional medication, all of which can further complicate the treatment of an already fragile population
- While the peri-operative complication rate is relatively static, the long-term complication rate should be addressed by carefully monitoring those who are at an increased risk
- This is the largest recent evaluation of CVAD complications within a single institution
- This study represents the largest report on a Hispanic pediatric leukemia population to date

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