



No tourniquet reduces the incidence of asymptomatic deep venous thrombosis identified on ultrasonography after arthroscopic anterior cruciate ligament reconstruction: an observational study

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Disclosure of Conflict of Interest

Name of presenter: Masaki Nagashima

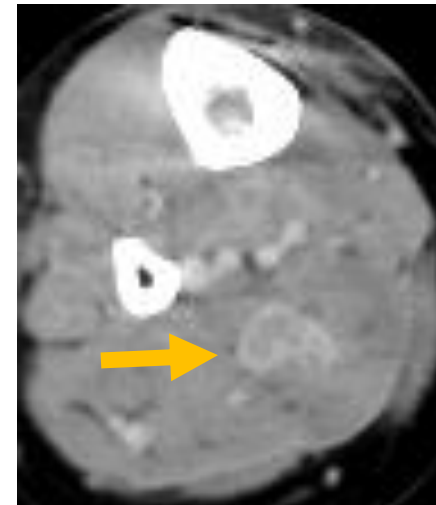
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with regard to our presentation.

Background

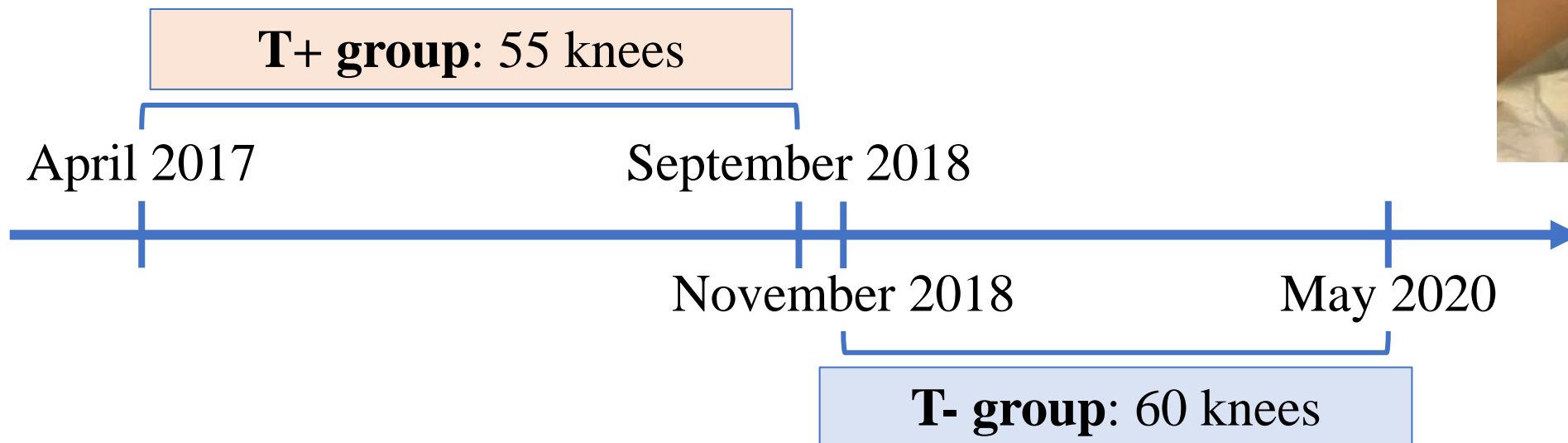
- Deep venous thrombosis (DVT) is a complication following arthroscopic anterior cruciate ligament reconstruction (ACLR). DVT has the potential to develop into life-threatening pulmonary embolism (PE).
- The incidence of DVT after ACLR: 6.6% ~ 41.2%
(Marlovits S, et al. *Arthroscopy*. 2007)
(Nagashima M, et al. *J ISAKOS*. 2019)
(Oshiba H, et al. *J Orthop Sci*. 2020)
- Prolonged tourniquet use is reported to be the risk factor for DVT after ACLR.
(Dong J, et al. *KSSTA*. 2015)
- There is a potential to reduce the incidence of DVT by completely not using tourniquet.
However, it has not been clarified.

The purpose of this study was to compare the incidence of DVT after ACLR with and without tourniquet use.



Materials and methods

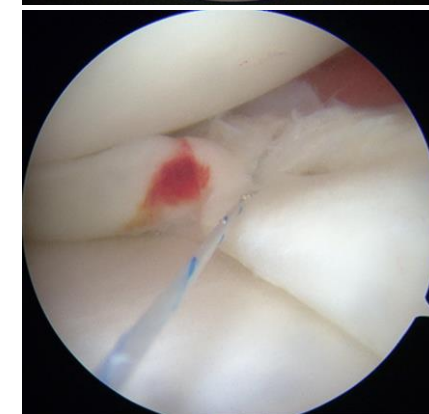
- Between April 2017 and May 2020, 115 knees of 111 patients who underwent ACLR at our hospital, including 17 revision surgeries, were enrolled in this study.
- The mean age was 28.7 years (range, 12 to 73 years).
- 57 female and 54 male
- Until September 2018, 55 ACLR were performed with tourniquet (**T+ group**) and 60 ACLR after November 2018 were performed without tourniquet (**T- group**).



Operative procedure

All of the ACLRs were performed by one experienced surgeon.

- General anesthesia with femoral and sciatic nerve blocks
- Hamstring autograft
(In revision ACLR, the graft was harvested from the contralateral side.)
- Single bundle reconstruction
- In T- group, an irrigation pump was used.
(DYONICS 25, Smith & Nephew)
- All inside repair for the repairable meniscus tears
(Fast-Fix 360, Smith & Nephew)
- Closed-suction drain: 24 hours



POD; postoperative day

ACLR

1POD

5POD

7POD



Post-operative protocol

Immobilization

ACLR

ACLR + meniscal repair

Walk with full weight bearing

Thromboprophylaxis

Intermittent pneumatic compression

Elastic bandage or compression stocking

None received pharmacological prophylaxis.



Examination of DVT

- DVT was detected by Ultrasonography (US).
- US was performed preoperatively and on the 7 POD.

Outcome

- **Primary outcome:** The incidence of DVT
- **Secondary outcome:** Operative time
Postoperative blood loss from the drain

Statistical analysis

- These factors were compared between the two groups using Student's *t*-test, the Mann-Whitney *U* test, and the χ^2 test. A value of $P < 0.05$ was considered significant.

Results: Patient demographics

		T+ group (n=55)	T- group (n=60)	p
Age (year)		30.5 ± 15.1	27.1 ± 12.1	0.187
Sex	Female	28	30	0.922
	Male	27	30	
BMI (kg/m²)		22.6 ± 2.5	23.6 ± 3.8	0.087
Current smoker	(+)	4	4	0.899
	(-)	51	56	
Time interval from injury to ACLR	< 3M	22	28	0.471
	≥ 3M	33	32	
ACLR	Primary	45	53	0.326
	Revision	10	7	
Meniscus repair	(+)	20	31	0.099
	(-)	35	29	

➤ There was no significant difference in patient demographics between the two groups.

	T+ group (n=55)	T- group (n=60)	p
DVT (n) (%)	9 (16.4%)	1 (1.7%)	0.005
Operative time (min)	80.8 ± 18.7	78.5 ± 15.1	0.461
Postoperative blood loss (ml)	201.9 ± 76.9	149.9 ± 60.3	<0.001

- **The incidence of DVT was significantly reduced by no tourniquet use.**
- Although there was no significant difference in operative time, postoperative blood loss was significantly reduced in no tourniquet use.
- All patients with DVT were asymptomatic.
- In 9 of 10 patients, DVT was found in the injured side.
- All but one DVT was found distal to the knee.

Discussion

Risk factors reported for DVT after ACLR

- Advanced age > 35 years old
(Gaskill T, et al. *AJSM*. 2015)
- > 40 years old
(Jameson SS, et al. *Knee*. 2012)
- Additional surgery
Other ligament reconstruction and HTO
(Bokshan SL, et al. *OJSM*. 2018)
- Tourniquet use for more than 2 hours
(Dong J, et al. *KSSTA*. 2015)

The results of this study indicate that tourniquet use itself is a risk factor for DVT.

The effect of no tourniquet use on ACLR

■ Postoperative DVT

Virchow's Triad

- ① Venous stasis
- ② Endothelial injury
- ③ Hypercoagulability

No tourniquet use improves mainly venous stasis.

■ Blood loss

Blood loss from the surgical drain after ACLR was significantly reduced in no tourniquet use.

(Nakayama H, et al. *J Orthop Sci.* 2013)

If an adequate visibility of the surgical field is secured, ACLR without tourniquet use is safer than that with tourniquet use.

Conclusions

- The incidence of DVT was significantly reduced by no tourniquet use.
- Although there was no significant difference in operative time, blood loss from the drain was significantly reduced by no tourniquet use.
- If the adequate visibility of the surgical field is secured, ACLR without tourniquet use is safer than that with tourniquet use.

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