AO Trauma Webinar—Periprosthetic fracture —THA周囲骨折

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AO Trauma Webinar
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Conflict of Interest Declaration
Speaker: Masayuki Ito

I have the following financial relationship to disclosure.

Endowed Chair: Aidu chuo hospital

Learning Objective

・既存インプラントのゆるみの評価方法とその限界について知る
・インプラント周囲骨折のX診断・分類ができる
・骨接合術・インプラント再置換の選択を含めた治療方針を説明できる
・内固定方法のPitfallを説明できる

Implant loosening

NO → ORIF

YES → Revision

Implant loosening (revision for primary THA)

- Patient
- Implant
- Pre-existing symptom
- Plain radiograph (X-ray)
- CT
- MRI

Patient

- Age younger (≦40) older (≧85)
- Sex male > female
- Comorbidity

Prokopetz 2012

Implant

- Cementless
  - coating, area
- Cement
  - technique
- Polyethylene (UHMWPE)
- Metal on metal

Pre-existing symptom

- Painful THA
  - A post-operative pain free interval
  - Location ex. Thigh pain
  - Timing ex. rest pain, night pain
  - Severity

Plain radiographs

- Hip AP, Lat
- Femur AP, Lat
  - Radiolucency
  - Subsidence
  - Osteolysis
  - Aseptic loosening
  - Polyethylene wear

➡ Nuance (change over time)

Definitive loosening of cemented femoral components

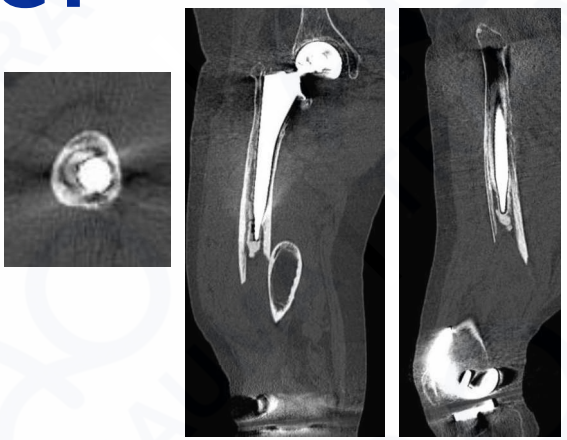
- Implant subsidence
- New prosthetic cement radiolucency
- Cement mantle fracture
- Implant fracture

Well-fixed implant

- **Major sign** for **uncemented** femoral implants
  - Lack of radio-lucense lines around the porous ingrowth portion of the component
  - The presence of endosteal spot welds
- **Minor sign**
  - A stable distal stem, calcar atrophy
  - Absence of a bony pedestal at the component tip

Bugbee 1996

CT



MRI

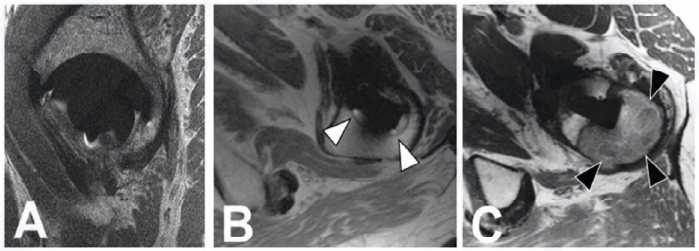


Fig. 2 A-C Using MR imaging, we graded osseous integration as (A, sagittal PD FSE) 0, no osseous resorption; (B, axial PD FSE, white arrowheads); 1, fibrous membrane formation; and (C, axial PD FSE, black arrowheads) 2, osteolysis.

Burge 2019

MRI

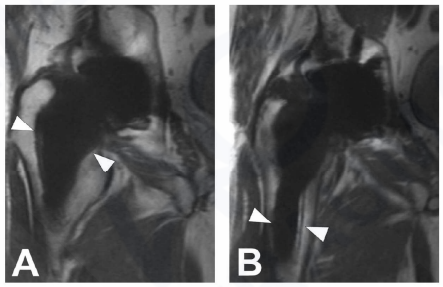


Fig. 3 A-B (A, B) Coronal MAVRIC-SL PD images in a 74-year-old man with painful THA demonstrate fibrous membrane formation surrounding the femoral component, the extent of which was compatible with component loosening, which was confirmed operatively.

Acetabular component
Sensitivity 83%
Specificity 98%

Femoral component
Sensitivity 75%
Specificity 100%

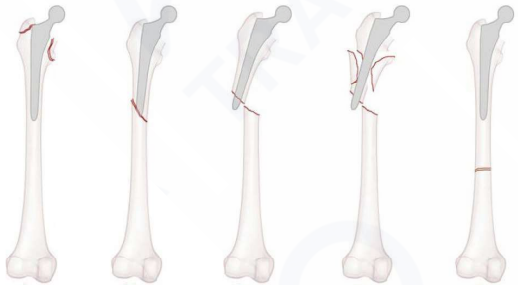
Burge 2019

Classification (分類)

Vancouver分類

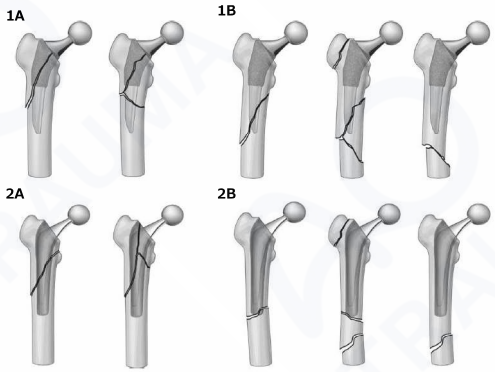
Type A 大転子・小転子を含む骨折
Type B ステム周囲かステム直下
- B1 ステム安定
- B2 ステムルースニング
- B3 ステムルースニング＋Bone stockが少ない

Type C ステムより遠位

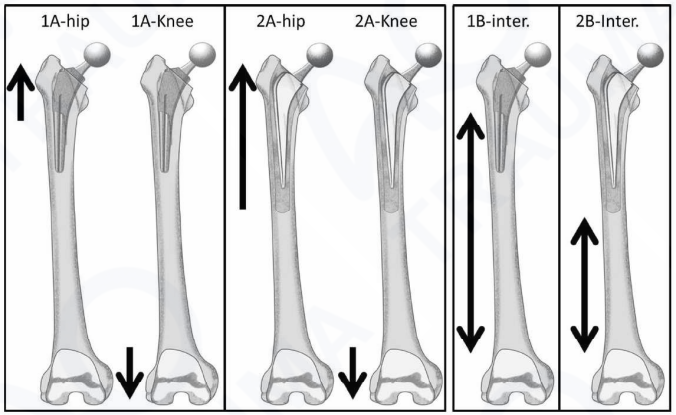


Baba分類

Type1 Cementless stem　Type2 Cement stem
ステムと骨の接着部分が骨折をしているか否かでA/Bに分類される



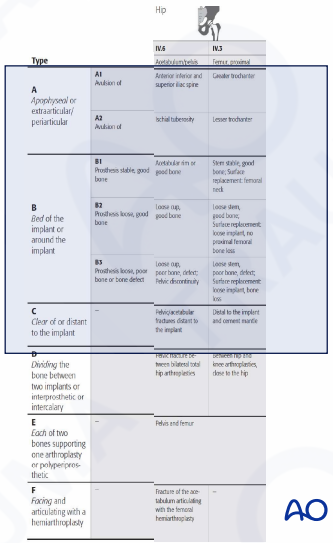
Baba 2015



Baba 2017

AO classification

Vancouver classification



Vancouver type C

Failure

Distal 4 bi-cortical screw
Proximal
2 plate and cable system
four proximal fixation

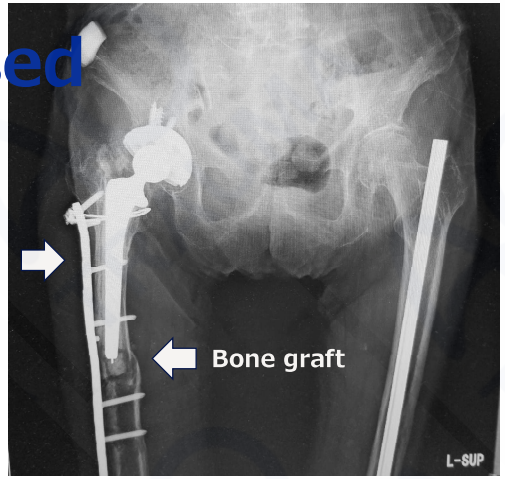
Additional plate
Strut allograft

(Corten 2009) (Adbel 2015)

Overlap 6cm
(Walcher 2016)

Revised

Overlap



Vancouver type C

- Union 29/ 30 96.7% (6.4 months)
- Complication 26.5%
- Infection 8.8%

Corten 2009

Whole span plating

one of the solution?

Arch Orthop Trauma Surg (2014) 134:9–14
DOI 10.1007/s00402-013-1883-6

ORTHOPAEDIC SURGERY

Treatment of periprosthetic femur fractures around a well-fixed hip arthroplasty implant: span the whole bone

Gele B. Moloney · Edward R. Westrick · Peter A. Siska · Ivan S. Tarkin

Vancouver type B

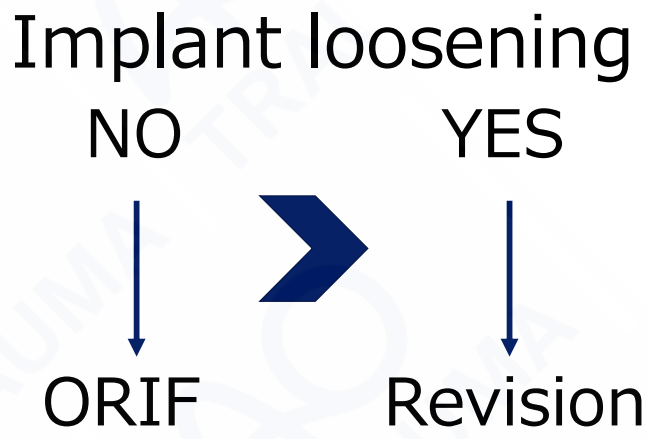
Vancouver B1

ORIF + stem loosening is associated with extremely high failure rate

45 cases 20% 9 cases = loosening

HIP is dislocated in order to confirm the stability of the femoral component

Corten 2009
Adbel 2015



The evaluation of loosening

- Subjective
- Operator's experiences

Vancouver B2-3

Systematic review

Table I. Total numbers and re-operations of Vancouver B2 and B3 fractures by the type of fracture

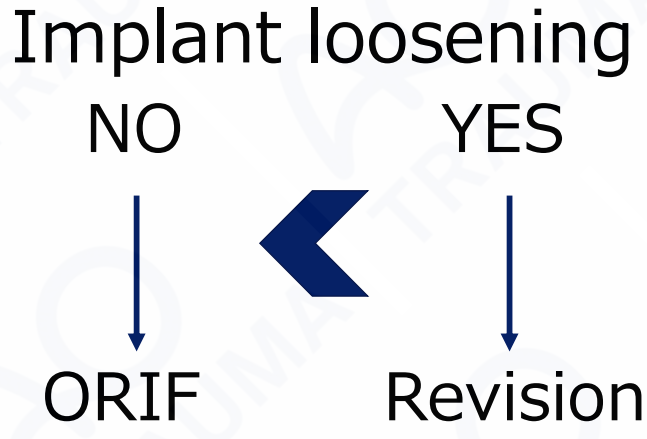
	Revision with or without ORIF			ORIF without revision	Total
Fracture type	**Cemented**	**Uncemented**	**Unspecified**		
Total Type B2 fractures	82	150	60	45	340
Re-operations Type B2 fractures, n (%)	11 (13.4)	19 (12.4)	7 (11.1)	6 (13.3)	43 (12.5)
Total Type B3 fractures	49	90	21	7	167
Re-operations Type B3 fractures, n (%)	8 (16.3)	12 (13.3)	3 (14.3)	2 (28.6)	25 (15.0)

ORIF, open reduction and internal fixation

Table II. Indications for re-operation by type of fracture

Indication for re-operation	B2 fractures	B3 fractures
Refracture	9	2
Infection	3	3
Subsidence	6	3
Stem loosening (aseptic)	4	1
Nonunion	4	0
Dislocation	4	2
Wound infection/superficial haematoma	4	3
Implant breakage	1	1
Not specified	8	10
Total	43	25

(Kahn 2017)



Implant loosening

NO

YES

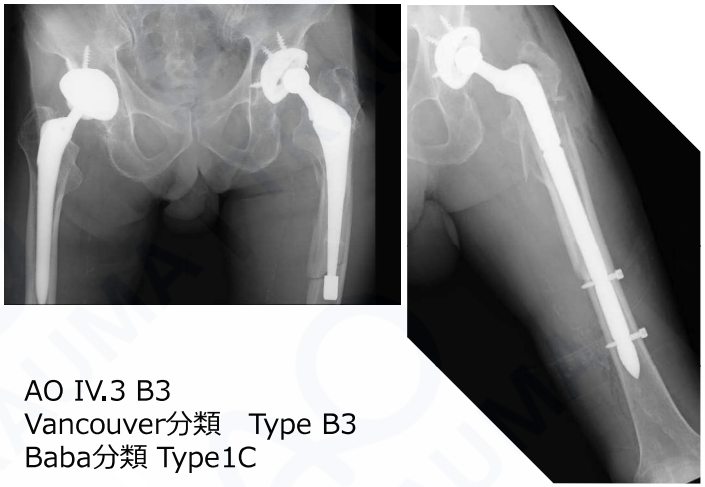
- Age
- Comorbidity
- Operator
- e.t.c.

ORIF

Revision

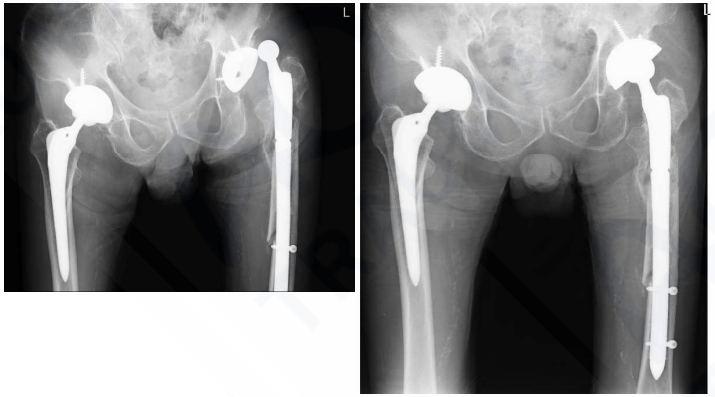
Goals are two-fold (revision THA)

- Restore long-term implant stability
- Allow fracture healing



AO IV.3 B3
Vancouver分類　Type B3
Baba分類 Type1C

Courtesy to Ryosuke Mashiko



Cup revised

Implant loosening

NO

YES

- Dislocation
- Implant breakage
- e.t.c.

ORIF

Revision

Tapered fluted titanium stems in the management of Vancouver B2 and B3 periprosthetic femur fracture (Munro 2014)

- 46 cases
- 54 months

- 2 femoral stems were revised
  - subsidence/ deep infection
- One non-union/ improvement of bone stock 89%
- Subsidence 24%

- WOMAC 75 and 82 of 100
- Satisfaction score 91 of 100

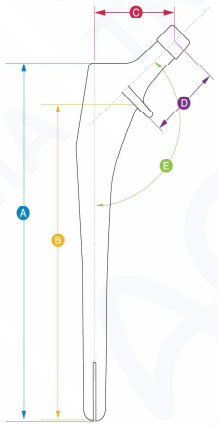
S-ROM (Depuy-Synthes社)
（同社カタログより）

CORAIL® Revision ステム
スタンダードオフセット

Stem Size	Stem Length (mm) (A)	Stem Length (mm) (B)	Offset (mm) (C)	Neck Length (mm) (D)	Neck Shaft Angle (E)
10	180	157	39.5	38.5	135°
11	185	162	40.0	38.5	135°
12	190	167	41	38.5	135°
13	195	172	41.5	38.5	135°
14	200	177	42.5	38.5	135°
15	205	182	43	38.5	135°
16	210	187	44	38.5	135°
18	220	197	45	38.5	135°
20	230	207	46	38.5	135°

CORAIL® Revision ステム
ハイオフセット

Stem Size	Stem Length (mm) (A)	Stem Length (mm) (B)	Offset (mm) (C)	Neck Length (mm) (D)	Neck Shaft Angle (E)
10	180	157	46.5	43.2	135°
11	185	162	47.0	43.2	135°
12	190	167	48.0	43.2	135°
13	195	172	48.5	43.2	135°
14	200	177	49.0	43.2	135°
15	205	182	50.0	43.2	135°
16	210	187	50.5	43.2	135°
18	220	197	51.5	43.2	135°
20	230	207	52.5	43.2	135°



CORAIL revision stem® (Depuy-Synthes)

Take home message

- Classificationを理解、Loosening +/-の診断をして、治療方針を決定する
- 患者の状態、術者の技量により、ORIF、再置換、双方の準備を怠らない
- 再置換は大腿骨側だけでなく臼蓋側も必要になることがある

Questions and Answers Session