

FlexPLI Repeatability in Car Tests

Action List Item 1. i)
Evaluation of reproducibility and repeatability

5th IG GTR9-PH2 Meeting
6-7/December/2012
Japan Automobile Manufacturers Association (JAMA)
Pedestrian Safety Experts Group

GTR9-4-19

Overview of NHTSA Pedestrian Activities

Sept. 17-18, 2012

GTR9-4-19

FlexPLI: Repeatability

Previous	Current	IWG Question
<ul style="list-style-type: none">FlexPLI was demonstrated to provide very repeatable results in limited repeated vehicle testing	<ul style="list-style-type: none">Conduct multiple tests to same location with our FlexPLI	<ul style="list-style-type: none">Have any labs examined Flex repeatability in vehicle bumper impacts?

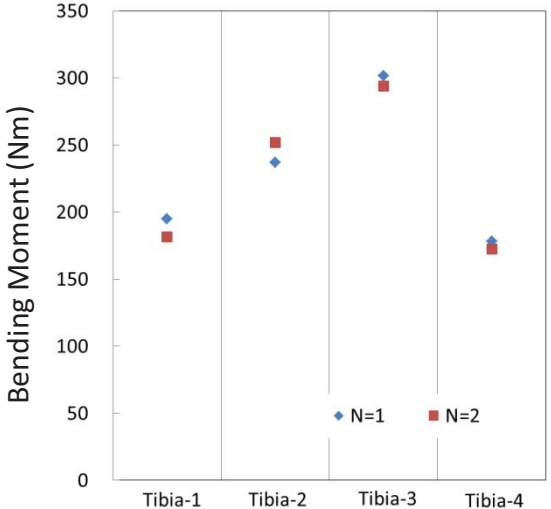
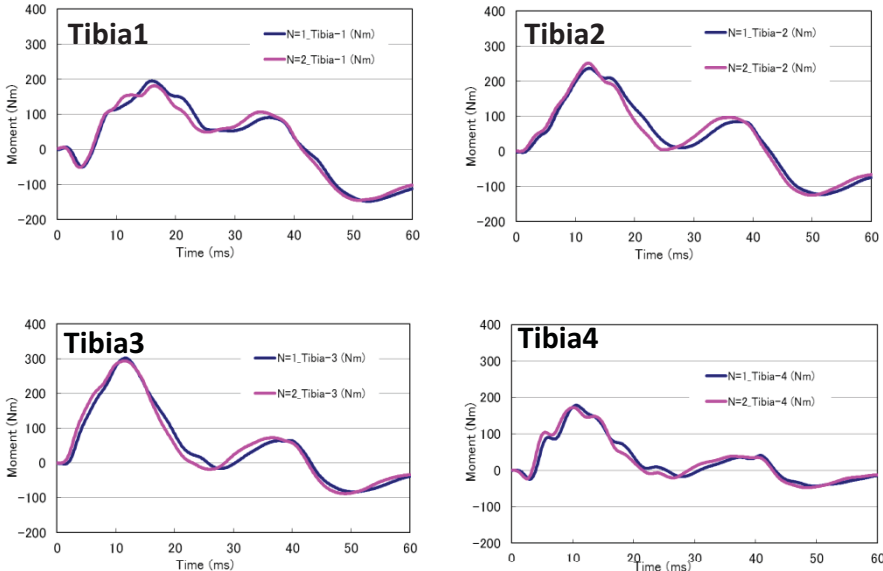
FlexPLI Car Tests by JAMA Members GTR9-5-11

- Car tests using FlexPLI mass production model
- Tests against 3 vehicles
- Car A: 2 repeated tests, 2 test points
- Car B: 2 repeated tests, 1 test point
- Car C: 3 repeated tests, 1 test point
- 3 tests with Car C include symmetric test points (2 tests on right side and 1 test on left side)

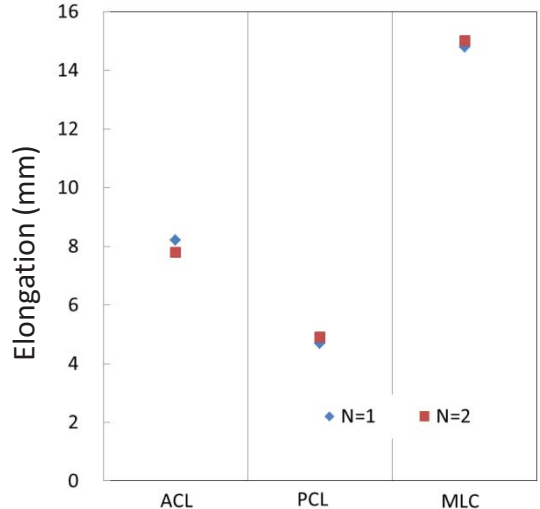
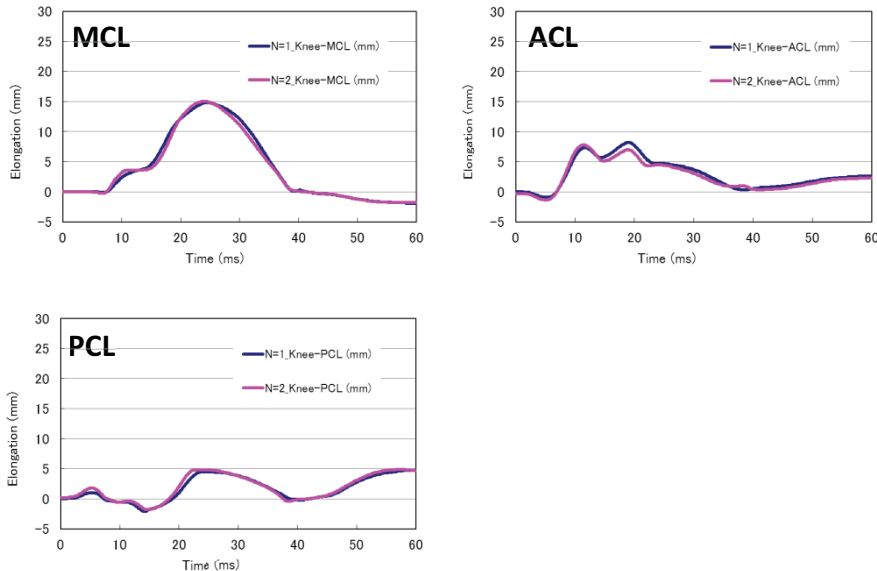
Test Results

GTR9-5-11
Car A, Test Point 1

Tibia



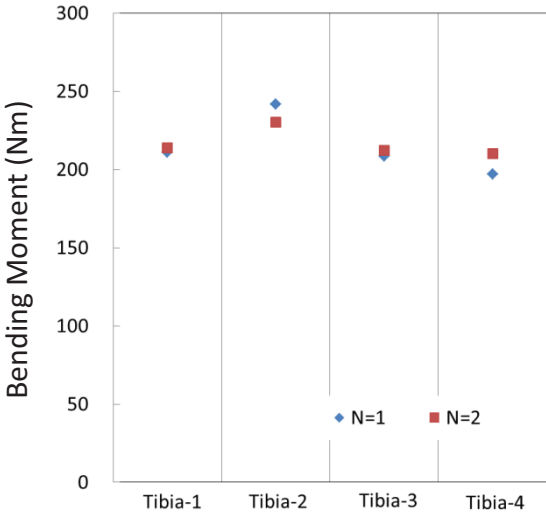
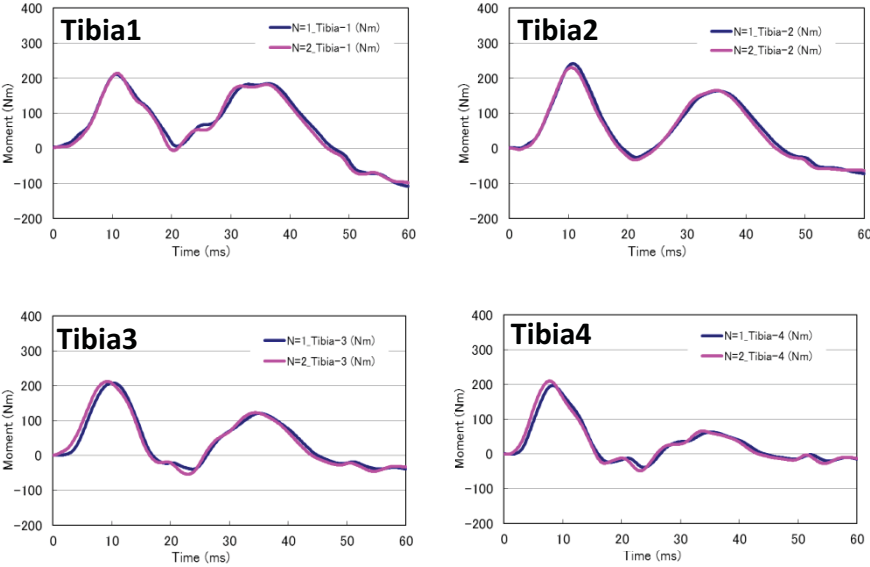
Knee Ligament



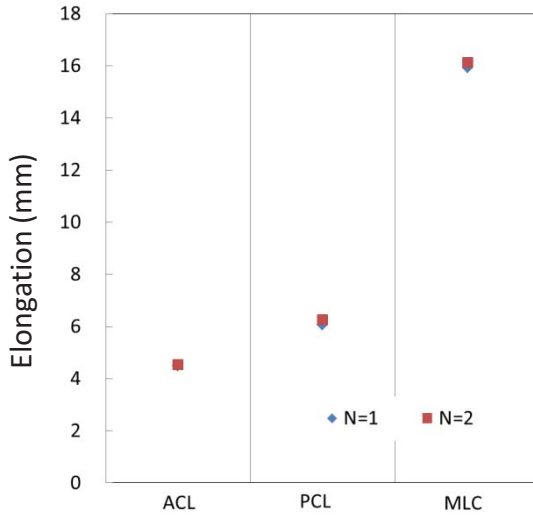
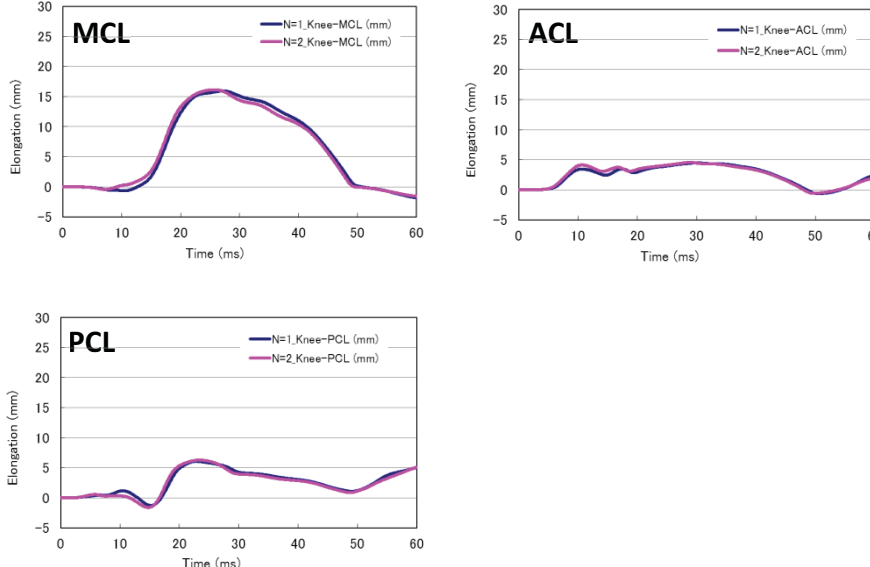
Test Results

GTR9-5-11
Car A, Test Point 2

Tibia



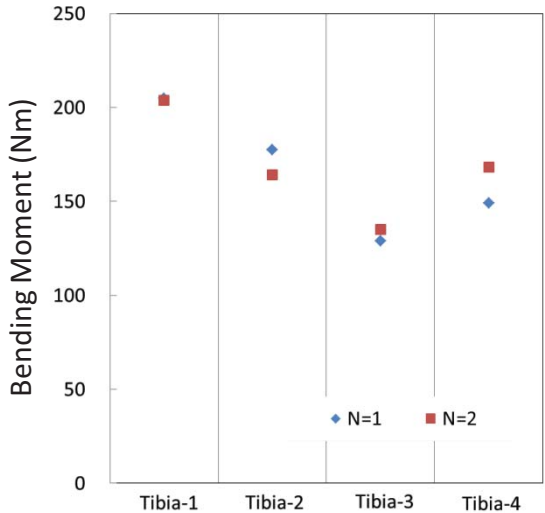
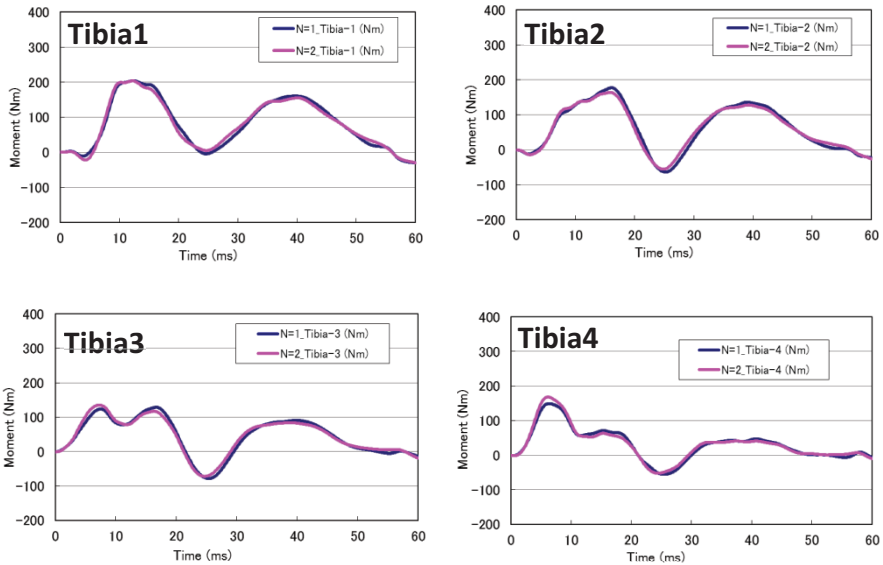
Knee Ligament



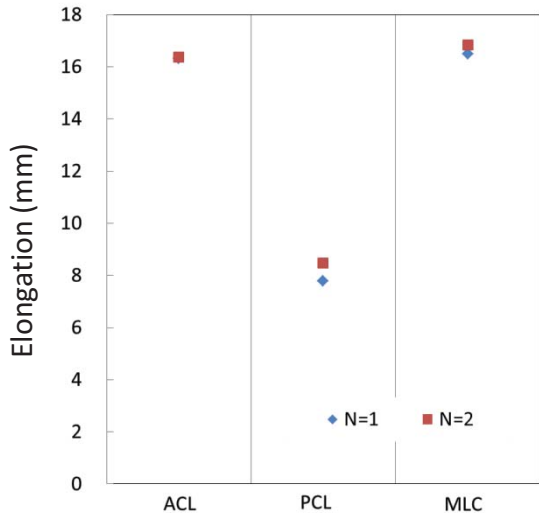
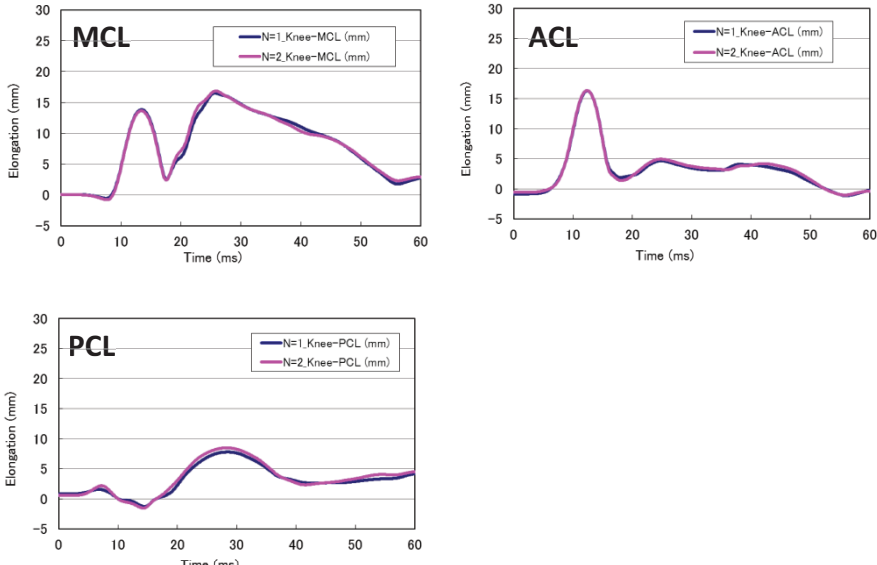
Test Results

GTR9-5-11
Car B, Test Point 1

Tibia



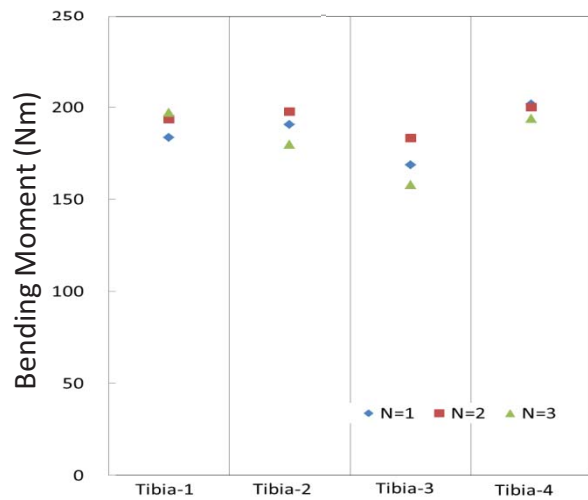
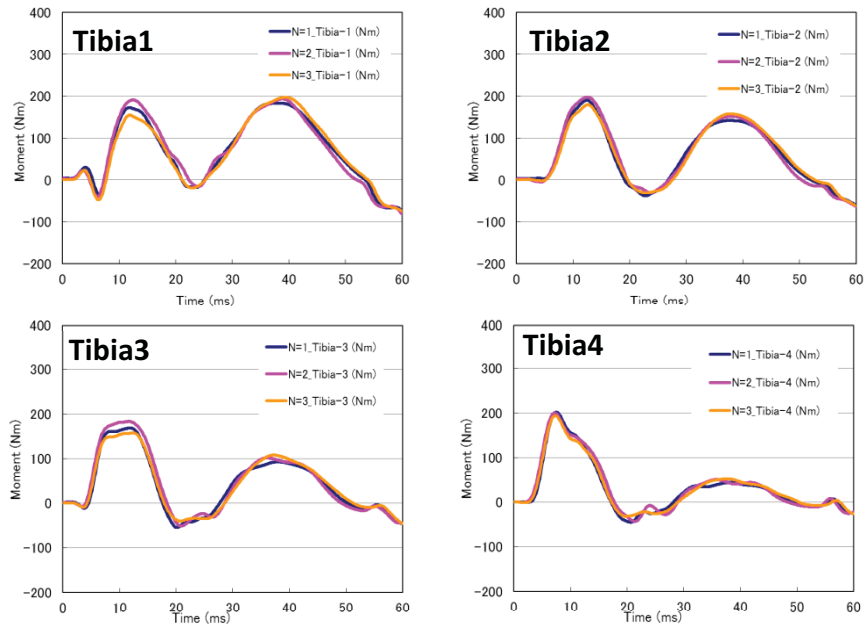
Knee Ligament



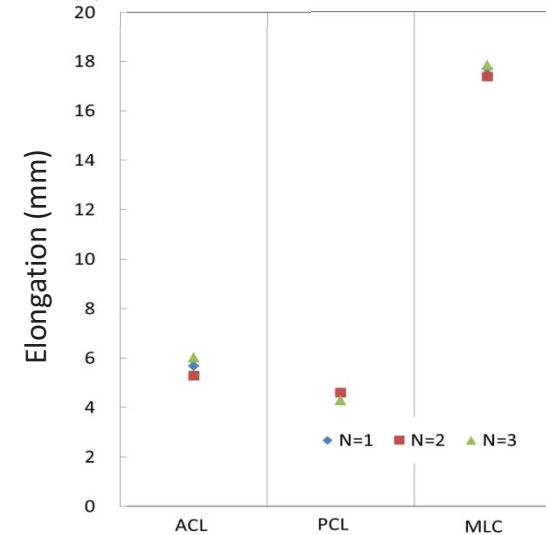
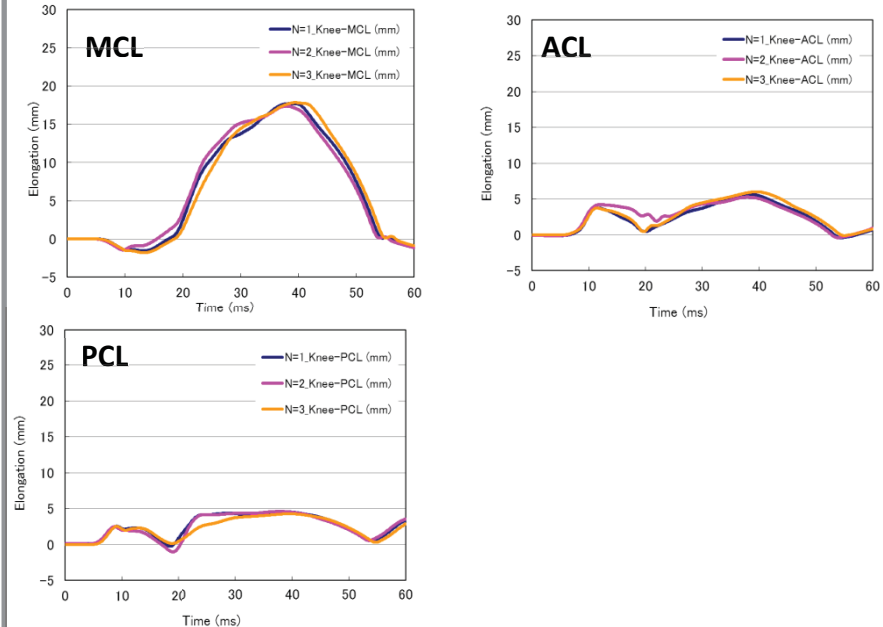
Test Results

GTR9-5-11
Car C, Test Point 1

Tibia



Knee Ligament



Evaluation of Test Results

GTR9-5-11

1. Comparison of Time Histories (Car A – C)

Good repeatability confirmed

2. Evaluation of Coefficient of Variation (Car C)

Peak Injury Measures and CV Values

	Tibia-1 (Nm)	Tibia-2 (Nm)	Tibia-3 (Nm)	Tibia-4 (Nm)	Knee-ACL (mm)	Knee-PCL (mm)	Knee-MCL (mm)
N=1	184	190	169	202	5.7	4.6	17.7
N=2	193	198	183	200	5.3	4.6	17.4
N=3	197	180	158	194	6.0	4.3	17.8
Avg.	191	189	170	198	5.7	4.5	17.6
St. Dev.	6	7	10	3	0.3	0.1	0.2
CV (%)	3.0	3.9	6.1	1.7	5.3	3.2	1.1
Standard value	340	340	340	340	13	13	22
Standard value/St. Dev.(%)	1.7	2.2	3.1	1.0	2.3	1.1	0.9

Distribution of CV Values

	Good	Acceptable	Marginal
CV	2	5	0
	29%	71%	0
Standard value/St. Dev.	6	1	0
	86%	14%	0

Judgements

Good: < 3%

Acceptable: 3% ≤ and < 7%

Marginal: 7% ≤ and < 10%

Not Acceptable: > 10%

Rating scheme taken from Flex-TEG Document (TEG-105)

All measures fell within Good or Acceptable (CV less than 7%) in Car Tests