

ICUC Remote Mentorship Project

The value of adequate intra-operative image documentation and interactive 3D colored models

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1. Introduction

Surgical education is a complex task. For skills acquisition, in addition to theory, practical exercises and simulations, real-time supervision in the OR by experienced mentors is considered optimal. However, availability of such mentoring is not guaranteed all over the world. Training systems, like health care in general, vary from one country to another. Therefore, also referral possibilities for complex cases might be limited for geographical or economic reasons.

Consequently, in certain countries young surgeons might be obliged to treat pathologies they have seen, operated by experienced surgeons, but not performed themselves under supervision.

This is the motivation for the development of the “ICUC remote Mentorship project”.

2. The mentorship process

The didactic potential of a complete intra-operative image data set has become evident for the members of the ICUC group after a long experience with the use of such data. This motivated the senior author (AF) to launch a project of remote mentorship for a group of young surgeons to whom he could not offer an in-presence mentorship in the OR, but who could take advantage of both his recommendations for a specific case and the real-world data of similar cases provided by the ICUC repository, offering intra-operative details/tricks, difficulties and pitfalls. Fig. 1

3. Material and methods

We analyzed 32 proximal tibia fractures operated by younger surgeons using suggestions of the first author and consultation of the ICUC database. In 3 cases remote suggestions were not registered.

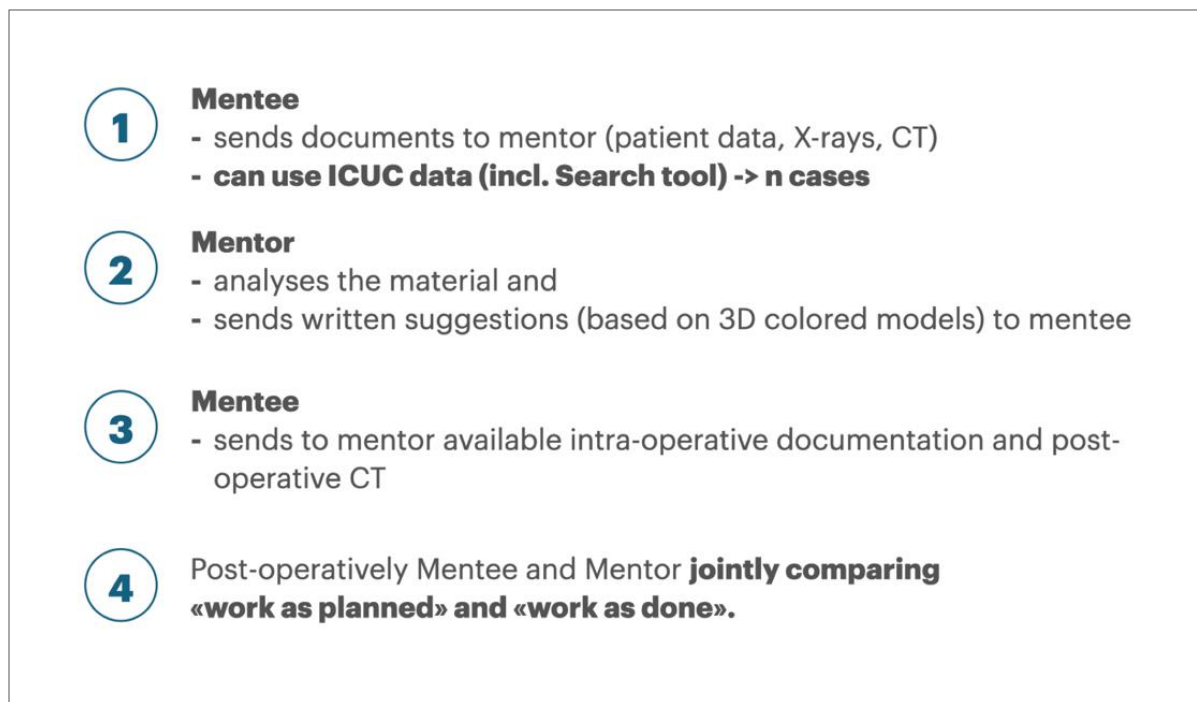


Fig. 1: Process

All patients had given their informed consent for the use of the documents for the consultation (with the first author) and for the use of intra-operative as well as postoperative documents.

3D colored models, produced by contributors part of the ICUC research team* on the base of preoperative CT data of the patients, have been fundamental for an easy communication (short written suggestions of mentor).

The young colleagues had also free access to all images of similar cases in the ICUC repository (www.icuc.net) allowing to select according to their individual needs and wishes.

* *Fernando Foglino and Lucía Chiquiar are the contributors in charge of producing the 3D colored models.*

Case	Gender	Age	PRE CT	3D Colored	Recommendation	POST CT	F UP
1	F	65	Y	Y	Y	Y	Y
2	M	20	Y	Y	Y	Y	Y
3	M	60	Y	Y	Y	Y	Y
4	M	25	Y	Y	Y	Y	Y
5	F	35	Y	Y	Y	Y	Y
6	F	20	Y	Y	Y	Y	Y
7	F	40	Y	Y	Y	NO	Y
8	F	30	Y	Y	Y	Y	Y
9	F	20	Y	Y	Y	Y	Y
10	F	40	Y	Y	Y	Y	Y
11	F	40	Y	Y	Y	Y	Y
12	F	30	Y	Y	Y	Y	Y
13	F	25	Y	Y	Y	Y	Y
14	F	20	Y	Y	Y	Y	Y
15	F	35	Y	Y	Y	Y	Y
16	M	65	Y	Y	Y	Y	Y
17	M	60	Y	Y	Y	Y	Y
18	F	70	Y	Y	Y	Y	Y
19	M	50	Y	Y	Y	Y	Y
20	M	40	Y	Y	Y	Y	Y
21	M	45	Y	Y	Y	Y	Y
22	F	40	Y	Y	Y	Y	Y
23	M	20	Y	Y	Y	Y	Y
24	M	45	Y	Y	Y	Y	Y
25	M	25	Y	Y	Y	Y	NO
26	M	45	Y	Y	Y	Y	Y
27	F	65	Y	Y	Y	Y	Y
28	F	25	Y	Y	Y	Y	Y
29	F	35	Y	Y	Y	Y	Y
30	F	75	Y	Y	NO	Y	Y
31	F	80	Y	Y	NO	Y	Y
32	F	40	Y	Y	NO	Y	Y

Table 1: 32 consecutive tibial plateau fracture cases treated with ORIF, were registered in a Twin Hospital center from 01/01/2021 to 12/31/2023. In 3 cases remote suggestions were not registered.

The data set including the recommendations of the mentor are visible on the ICUC repository (www.icucplus.net)

4. Results

Among the 32 cases, there was a large spectrum of fracture types, with partial or complete articular involvement.

The traditional fracture classification system was insufficient for categorizing the fractures effectively, so instead, a tagging system was implemented. This approach allowed for more flexible and precise grouping of fractures based on shared

characteristics. The use of a search tool then made it easier to retrieve cases sharing similar features. Fig. 2.

← Filter by tags

×

LATERAL PLATEAU
☐ Intact cortex
 ☐ Broken cortex
 ☐ Intact joint
 ☐ Posterior column intact
 ☐ Posterior column involvement
 ☐ Large joint fragment
 ☐ Depressed joint fragment

☐ Large
 ☐ Small
 ☐ Comminuted

☐ Joint step

☐ Posterior
 ☐ Central
 ☐ Anterior

☐ Eggshell cortex
 ☐ Balcony cortex
 ☐ Shear plateau fracture

CENTRAL
☐ Posterior column intact
 ☐ Posterior column involvement
 ☐ Depressed fragment
 ☐ Depressed comminution
 ☐ TAT

☐ Intact
 ☐ Broken, part of lateral plateau

MEDIAL PLATEAU
☐ Intact cortex
 ☐ Broken cortex
 ☐ Intact joint
 ☐ Posterior column involvement
 ☐ Large posteromedial fragment

FIBULAR HEAD
☐ Intact
 ☐ Broken

☐ Widened plateau

RECOMMENDATION
☐ Open book
 ☐ Bone impactor
 ☐ Osteotomy

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FILTER

Fig. 2: Tags used to find similar cases

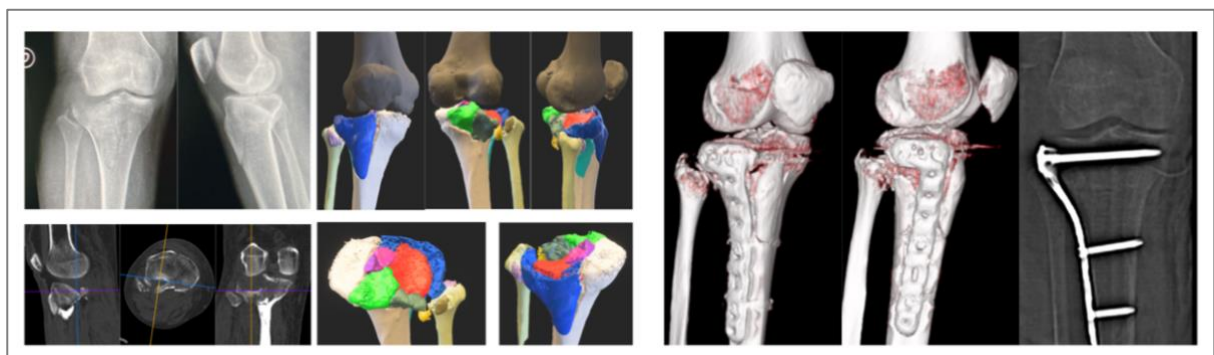


Fig. 3: Case example. *Left:* Pre-operative images sent to Mentor and interactive 3D color model | *Right:* postoperative result with good reconstruction cf. image details on ICUC repository (www.icucplus.net) CASE 1 / 65y Female

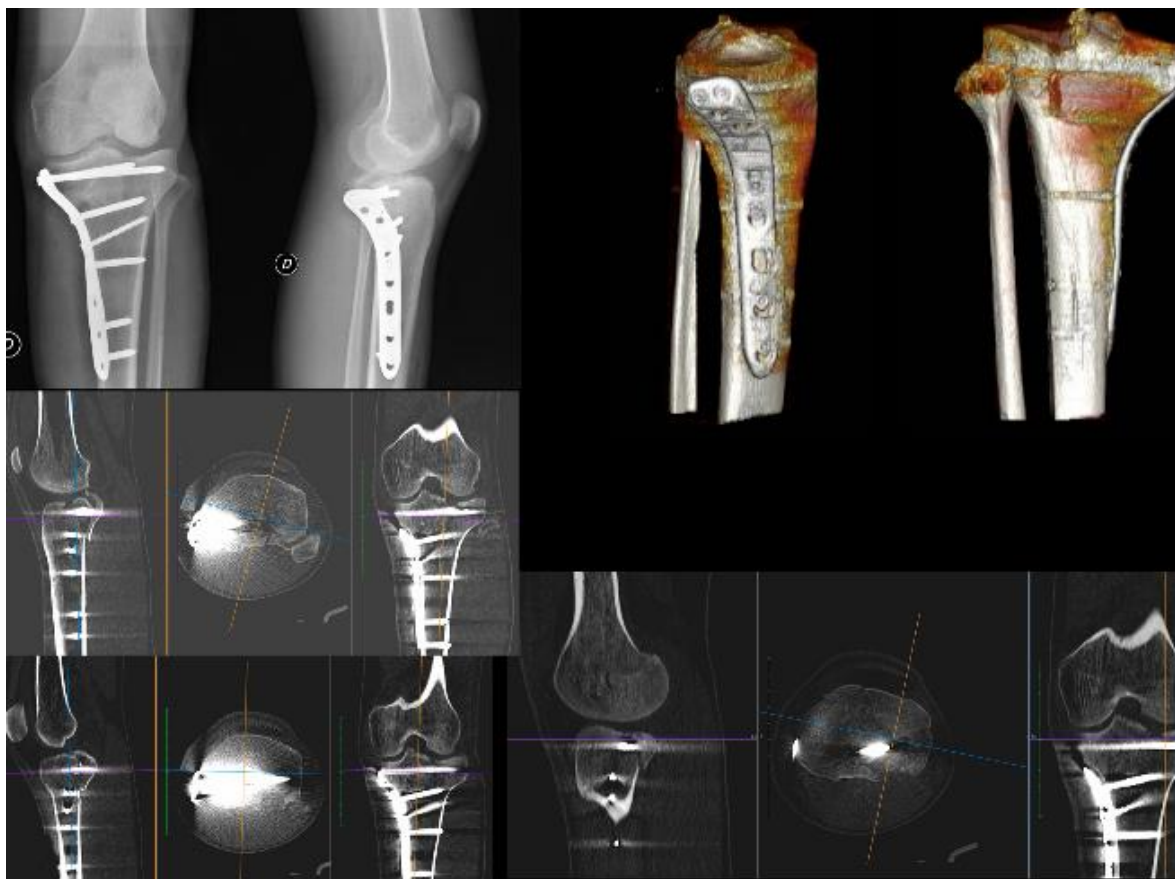


Fig. 4: Sub-optimal example. Sub-optimal result with plateau widening and articular incongruity, image details on ICUC repository (www.icucplus.net) CASE 2 / 20y Male

4. Discussion

The technical performance quality of the young surgeons has been remarkable, considering their limited experience (Fig. 3).

Clearly and not astonishingly, not all the cases are perfect (Fig. 4).

Surgical education and especially operative skills training is complex. Multiple tools exist and the IT era has brought significant improvements. However, nothing is as efficient as intra-operative assistance by an experienced mentor.

Unfortunately, this might not be available to everyone and everywhere.

Remote mentorship, i.e. advice by an experienced surgeon for the surgery of the next day, could come close to intra-operative mentoring, especially if “similar cases” can be extracted from a repository and especially if intra-operative details of such cases are accessible to mentee.

The results presented here are encouraging.

Different factors have probably been determinative:

3D colored models help to capture and understand the details of the fracture pattern easily and quickly and facilitate communication.

Suggestions of an experienced professor combined with free access to complete data of similar cases from the ICUC dataset offer a learning opportunity to both Mentee and Mentor.

The amount of the intra-operative image documentation is sufficiently informative to allow postoperative comparison of “work as planned” and “work as done”.

Further improvements are conceivable, if head-mounted smart glasses would allow an adequate documentation of high photo-quality without additional effort and time-loss.

Clearly, this experience does not suggest to replace intra-operative real-time instruction by a master surgeon, but such opportunities might not be available everywhere in the world. The same is true for the possibility of transferring the patient to an experienced surgeon in another center.

5. Summary

Health care systems are very different from one country to another. The referral of patients to specialists can be difficult due to geographical reasons or due to scarce density of surgical professionals. Therefore, intra-operative supervision of young surgeons by experienced colleagues/mentors might not always be possible.

We present encouraging results of a remote mentorship concept, where in- presence mentoring was not possible and young surgeons were obliged to perform surgeries alone after receiving suggestions from an experienced mentor.

Interactive 3D colored models and access to exhaustive data of similar cases from large case series of the ICUC database have proven to be advantageous.

The results of 32 tibial plateau fractures treated by young surgeons with the described help of a remote mentor are encouraging.

References

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