A report article

The Orthofix Trauma Fragility Fractures Medical Education Course was held between 19 to 21 March 2018. Participants not only benefitted from an expansive and experienced faculty, but also able to take advantage of both the ICLO Anatomical Laboratories and Orthofix Headquarters.

More than 30 participants arriving from France, Italy, Germany, Israel, Malaysia and Switzerland took part to the three days practical training seminar on fragility fractures management – mainly orthopaedic surgeons and clinicians, but also some Orthofix personnel from the Marketing, Research and Development and Clinical Affairs departments.

The clinical faculty, reflecting the participant mix, involved five orthopaedic surgeons and an orthogeriatric physician:

- **Mr. Satyajit Naikie (faculty chair),** Charing Cross and St. Mary’s Hospitals, London;
- **Dr. Davide Blonna,** Ordine Mauriziano Hospital in Turin, Italy;
- **Prof. Dr. Roberto Civinini,** Careggi University Hospital, Florence, Italy;
- **Dr. Massimo Corain,** Borgo Roma University Hospital, Verona, Italy;
- **Dr. Thomas Gausepohl,** Lahn Dill Kliniken, Wetzlar, Germany;
- **Dr. Luigi Residori,** Department of Orthogeriatrics of Borgo Roma University Hospital, Verona, Italy.

The Orthofix faculty was headed by Elisa Luciani (Orthofix Global Medical Education Manager) who opened proceedings by highlighting the three-stage process that course participants would be guided through using the "tell me, show me, involve me" training. This methodology would be aided by clinical case discussions, interactive debates, and practical sessions in dry and cadaver labs, to explore:

1. The management of trauma fragility fractures, with particularly emphasis on orthogeriatric patients, using different surgical techniques and devices in order to achieve optimal bone stabilization and a faster bone healing, and minimize complications;
2. Becoming acquainted with an evidence-base and best-practice descriptors on the newest principles of multidisciplinary care in treating fragility fractures in older patients;
3. The unique networking opportunity amongst international colleagues with the aim of facilitating further knowledge transfer and future clinical and academic relationships.

In closing the session, **Mario Dandrea** (Orthofix Clinical Research Coordinator) ran a tutorial in optimising scientific research planning, and thereafter translating this into publication success.

During the course, the expert faculty presented numerous clinical cases, inviting the participants into their discussions to share doubts, controversial issues, and/or differing experiences.

From the beginning of proceedings, the chairman kicked off the course in a very interactive way collecting expectations from the audience:

- Share experience with other surgeons with different background and nationality
- Broad horizons
- Learn how to use different techniques with external fixation in elderly patients
- Rehabilitation of elderly patients with external fixation, focus on timing and methods
- Pin site care and infection treatment in patients with comorbidities
FRAGILITY FRACTURES: how to best organise hip fracture management

Roberto Civinini showed the advantage of a multidisciplinary approach to hip fracture management during the pre-hospital, in-hospital, and post hospital phases, to ensure that managing clinicians ‘never leave alone an older patient with a hip fracture’. Civinini proposed a coordinated health model made of two main elements: a ‘Hip fracture Unit’ to treat older patients when in hospital, and a ‘Fracture Liaison Service’ to prevent re-fracture episodes, re-surgery and potential complications after hospital discharge. Following the adoption of this model of co-managed care – in which a multidisciplinary team of orthopaedic surgeons, specialist geriatricians, anaesthesiologists, endocrinologists, and physical therapist – in Careggi Hospital, the:

- All admissions to the ward are now within 4 hours
- Fast track clinical evaluation is within 12 hours
- Average length of hospital stay has diminished from 11 to 8.3 days
- Intra-hospital mortality has decreased from 5.3% to 2.4%
- Post-surgery mortality within the first year has diminished from 24% to 14%
- Patient cognitive deficits have lowered from 38.4% to 25.4%
- All patients received personalised physiotherapy within 24 hours post-operatively
- Discharge, post treatment and follow up are accompanied by a program of rehabilitation exercises and food supplementations of calcium and vitamin D, in presence of osteoporosis

“This functional model of an ‘Orthogeriatric co-managed interdisciplinary team’, at the end, simply means a better quality of life for our older patients” - concluded Prof. Civinini.

WRIST

Massimo Corain started his presentation highlighting the importance of care in considering specifically the extrinsic and intrinsic ligaments that strengthen, guide and limit the movements of the wrist.

To assess the stability or instability of fractures, M. Corain quoted The Fernandez Classification (2001) which addresses the mechanism of injury and the consequent treatment options, according to five criteria. The Classification describes instability as high risk of secondary displacement after initial adequate reduction.

Although in most cases closed reduction is attempted, open reduction with internal or external fixation is often required when there is a failure to obtain or maintain closed reduction, or in more severe injuries to secure alignment in the treatment of fragility fractures in older patients.

The benefits of external fixation are numerous in the older population. When compared with internal fixation devices, an external fixator provokes less disruption of the soft tissues and less disturbance of osseous blood supply and periosteum.

According to M. Corain, external fixation devices are recommended in presence of:

- Comminuted and displaced fractures with risk of loss of reduction
- In conjunction with dorsalisation
- Radio/Ulna associated fracture instability
- Loss of reduction in cast (M. Corain: “in most cases, cast is not a good cast to obtain a sufficient fracture reduction, and often it is too bulky or heavy”)
- Complex fractures with skin contusions and open wounds, or in presence of skin with compromised healing potential, and with rheumatoid, peripheral vascular, metabolic syndrome and diabetes mellitus diseases.
The advantages of external fixation are:

1. Temporary and minimally invasive
2. Percutaneous
3. Early mobilisation
4. Simple removal
5. Soft tissue respect
6. Shorter learning curve, compared with internal fixation

Nevertheless, an external fixator may present some disadvantages:

1. Requires nursing and pin site care to prevent infections
2. Needs patient’s compliance
3. Can be bulky and uncomfortable

"Goal of a surgeon is to restore the natural biological and mechanical properties of the wrist as they were before the trauma" – said M. Corain in the wet lab. He showed how to apply a monolateral external fixator (Fig. 1) and a modular pin-to-bar fixator (Fig. 2) to the wrist, reminding the importance to maintain a functional position of the wrist (flexion and ulnar abduction max 20°) always guaranteeing the patient the possibility to move thumb and fingers freely.

The participants were reminded of:

a) Basic principles of external fixation:

- Reduce fractures carefully and anatomically
- Do not apply too much distraction to the joint
- Watch safe entering points and safe corridors, protect soft tissues
- Always follow safe insertion techniques of bone screws, pins and wires
- Mind the nerves: respect structures at risk!
- After three weeks, the external fixator can be unlocked to allow mobilisation, followed by a program of physiotherapy to restore the proper movement of the wrist and the muscular tone
- Union is anticipated at 6 weeks, treatment in an external fixator should not be longer than 6 weeks

b) Post-operative complications, such as persistent pain, mal-union and osteoarthritis, are general a function of incorrect device application, rather inherently caused by the device itself.
Thomas Gausepohl presented a series of clinical cases with severe injuries around the elbow (commonly affecting older patients secondary to osteoporotic bone stock), commenting on the treatment choices, and sharing the operative and functional outcomes.

- Minimally displaced fractures: they can be treated acceptably with conservative, non-operative approach
- Displaced fractures: either open reduction with internal or external fixation, or both; closed reduction with external fixation is an effective treatment in older patients with osteoporosis. It requires short hospitalization, allows early mobilisation of the elbow joint and a quick return to normal functions and daily activities. Decisions on the operative management of geriatric patients must consider: bone quality, the individual level of independence and the social context, balancing the surgical risks against the function outcome aimed for. According to T. Gausepohl, compared to internal fixation, external fixation is a less invasive technique, and particularly indicated in patients with poor quality bone – functional results are good, with reduced stiffness and increase of complications.
- Severely destroyed joints: total elbow arthroplasty is an option and complications might lead to severe inability of the extremity;
- Distal humeral fractures: this fracture pattern in elderly active patients frequently presents extensive fragmentation of bone and cartilage. ORIF is recommended but rarely stable enough for early mobilisation. External fixation with motion capability can help to prevent stiffness;
- Fractures of the proximal forearm – i.e. proximal ulna - are frequently combined with an extensive ligamentous damage and soft tissue problems. Treatment should include early mobilisation - i.e. an early motion fixator to achieve satisfactory functional results.

Goal of the surgeon is to allow early mobilisation without pain, having restored appropriate bone alignment.

During the wet lab, there was a demonstration on the correct application of a modular external fixator to the elbow (Fig. 3).

Tips and tricks by T. Gausepohl:

1. Early motion concept: movement is mandatory! Make the patient move the elbow as early and safely as possible
2. Mobilisation should respect the mechanical and functional movement of the joint
3. As surgeons we must rely on the natural, physiological process of bone healing
4. Supination may be a problem, not pronation
5. Practical experience reduces risk
6. After surgery, it is fundamental for the patient to start with physiotherapy as soon as possible
Davide Blonna highlighted both the operative management of proximal humeral fractures, and associated complications. These complications include, but are not limited to, avascular necrosis, mal-union, non-union, and infection.

In response to the aforementioned complication profile of more traditional operative modalities, in 2005 D. Blonna developed a new minimally invasive approach to address proximal humeral fractures. The method consisted of six long fine-threaded pins mounted on an external fixator. The technique was demonstrated to participants in the wet laboratory.

The surgical tips from the session include

- The patient must be placed in the beach chair position, the image intensifier on the contralateral side of the fracture, and the X-Ray beam at right angles to the operating table;
- Closed reduction of the fracture should be attempted through two manoeuvres. In the first manoeuvre the shoulder is taken into abduction with the capsule stabilised, thus reducing the varus displacement of the humeral head. The second manoeuvre requires the application of a posteriorly directed force to the arm to reduce the medial displacement of the humeral shaft and internal rotation of the head;
- Insertion of six threaded pins to stabilise the fracture (please refer to the Galaxy Fixation Upper Limb operative technique GF1101OPT for wire positioning), locked together with an external fixator. The longer threaded pins allow for improved purchase into bone both beneath the articular surface and in the far cortex of the metaphysis during bicortical fixation (Fig. 4);
- The post-operative care consists of early passive mobilisation of the shoulder, weekly pin and wound-site care, and pin removal after 40 days after surgery.

The observed results are (D. Blonna et al, 2017):

- Good anatomical reduction
- No limited range of motion full range
- No pain after surgery
- Outcomes: 5% with pin tract infection; 2% back to surgery

"Why leave something inside an older patient? The external fixator is easily removed after fracture consolidation, and the patient is treated with antibiotics" D. Blonna concluded.

1. There is evidentially more than one management option surrounding any one clinical scenario.
2. There is variation between countries and their institutions on how to best manage fragility fractures. The guidance available to stakeholders is influenced by public and private health policy. However, there does seem to be some consensus on best practice gradually emerging.
3. The decision-making process is key, and certainly before any surgery physically takes place.
DAY 2
PROXIMAL FEMUR

Professor Civinini re-visited the concept that “an orthopaedic surgeon alone is not sufficient to manage an older patient with a hip fracture”, pointing out around 50% of the patients with a hip fracture have already had prior fragility fractures. He classified the fractures (stable vs unstable), and indicated some treatment options:

1. **Intracapsular** (femoral head and femoral neck fractures):
   - Femoral head fractures are frequently addressed with small fragment or cannulated screws
   - Femoral neck, non-displaced fractures these fractures are frequently addressed with small fragment or cannulated screws
   - Femoral neck, displaced fractures these fractures are frequently addressed with hemiarthroplasty

2. **Extracapsular** (Intertrochanteric, pertrochanteric and subtrochanteric fractures):
   - Non-displaced fractures cannulated screws
   - Displaced fractures there is a Europe-wide variation of treatment protocols: intramedullary nailing systems, either short or long (in case of intertrochanteric fractures), or dynamic hip screws

   “A stable fracture is one that - once reduced and fixed - is compressed and minimally impacted by the weight-bearing force of single leg stance” (Browner BD et al. 2015)

3. **Atypical fractures** (“fatigue” fractures or often associated with Bisphosphonate use): these fractures are frequently addressed with intramedullary (IM) Nailing systems.

Attendees had the opportunity to practice using the intuitive Orthofix Chimaera IM Nailing system in the dry laboratory. (Fig. 5)

![Fig. 5 – Chimaera IM Nailing system](image)

In the first afternoon session, the audience engaged in clinical case discussions with the faculty. The conversation was focused on troubleshooting and potential surgical complications of proximal femoral fractures treated with an intramedullary nail.

LOWER LIMB

The second part of the afternoon was dedicated to complex trauma of the lower limb, and introduced by S. Naique. The session began with a lecture on peri-articular and articular fractures and respective treatment algorithms. External fixation was the preferred option in cases involving high grade of comminution, extensive articular involvement, and soft tissue injuries. External fixation, when applied in these critical patients, provides many advantages, not least due to its minimally invasive approach that benefits both complex fractures and a compromised soft tissue envelope. Furthermore, external fixation also offers the possibility of stabilising fracture fragments and restoring anatomical angles for optimal functional recovery. S. Naique also explained the U.K. NICE ([https://www.nice.org.uk/](https://www.nice.org.uk/)) guidelines for open fractures requiring an early and cohesive team approach combining orthopaedic trauma surgeons and plastic reconstructive surgeons, especially in cases involving severe soft tissue damage.

In case of polytrauma in older patients, the situation is even more complex and the surgical team often includes several additional specialties, such as the geriatrician, the cardiologist etc.
The audience had the great opportunity to watch an application of a hybrid external fixation system to a human specimen. Naique provided a systematic commentary for the surgical procedure, sharing his tips and tricks. After this detailed demonstration, the delegates spent the rest of the day in the wet lab, practising with hybrid (Fig. 6) and circular fixation frames (Fig. 7).

**Wire insertion technique** – the fundamental steps:

1. Place the wire on the surface of the ring and push it through the skin at the desired level and orientation to the bone surface
2. Insert the wire through the bone using a slow drilling speed and the "stop and go" technique
3. Once the wire exits the bone, drill or tap with a hammer to the opposite skin edge
4. Secure both ends of the wire to the ring
5. Tighten the wire to the ring on the side away from where the tension will be applied
6. Tension the wire
7. Tighten the wire to the ring on the tensioner side
8. Cut the wires flush to the frame

**Tips and tricks** - always pay attention to:

- When using stopper wires, tensioning both wires at the same time is recommended
- When determining wire orientation, consider cross-sectional anatomy, location of the second wire, and the long axis of the bone segment
- Thermal necrosis
- If a stopper wire is used, make a small stab incision along the wire track to allow the bead to pass through the skin

---

**DAY 2 TAKE HOME MESSAGES**

1. Clinical case discussion is useful and highly appreciated
2. Troubleshooting sessions are positive and educational
3. Keep in mind the above tips and tricks with Chimaera IM Nailing system
4. Revise the classification of stable vs. unstable hip fractures
5. External fixation is also a viable option for definitive treatment
Luigi Residori reiterated how an organisational model employing a multidisciplinary approach to fragility fractures helps an older patient to receive the best possible care. Residori explained why a geriatric-surgical co-managed service is fundamental in providing such a service, and that an example of a successful and innovative model will include a geriatrician assuming a prominent and leading role. In so doing, his department has experienced the following positive results:

- Shorter intensive care unit admissions
- Shorter hospital stays
- Lower costs per person
- Lower mortality

Frail patients (*) need assistance through the pre-operative and peri-operative period (including discharge, rehabilitation and transition to home). A complex medical history may involve conditions and diagnoses of osteoporosis, renal insufficiency, malnutrition, cardiopulmonary problems, hypertension, cerebrovascular disease, compromise of perfusion, and any number of the significant sequelae of diabetes. It is this complex array of medical issues that calls for the pre- and post-operative skills of a geriatrician, coordinating and integrating care. In particular, the oversight provided by a specialist orthogeriatric service can sensitively evaluate the correct therapeutic choice (in the context of likely polypharmacy), and thereafter dosage of medicines; such as, antibiotics (with the Cockcroft – Gault formula), and drugs to reduce pain.

During the post-operative phase, it is critical for older patients to be encouraged and guided carefully into activity and mobilisation.

Follow-up, post-operative nutritional supplementation and early mobilisation prevent pressure damage, deep vein thrombosis, pulmonary complications and disability.

(*) definition of frailty: “A syndrome with multiple reduced physiologic functions that increases an individual’s vulnerability for developing dependency and/or death”.

Teamwork

The final session was dedicated to knowledge consolidation and the development of critical research skills. The audience was split into two groups: while one group was analysing complex upper and lower limb cases with the clinical faculty, others attended a tutorial by Mario Dandrea, on how to write and publish a scientific article. A brief summary of the practical pathway within the research tutorial is as follows:

- choose the content, understand your research question, understand the available literature
- analyse data
- select the references
- follow the existing guidelines
- quote the sources correctly
- involve your local ethics committee at the earliest possible stage of research to ensure the project receives approval
- collect clinical data and comply with editor’s checklist

FINER is an acronym and methodological tool used in developing a research question and it may aid potential authors in ensuring their work has the best possible chance of publication. F stands for Feasible, I for Interesting, N for Novel, E for Ethical, R for Relevant.

Take home messages on how to write and publish a scientific article:

1) Work planning is mandatory
2) Use FINER method (see above)
3) Never give up, go on trying hard
4) working outside of one’s comfort zone is necessary for personal development
5) You are not alone, Orthofix is here to help: just ask
- Interaction is positive and constructive
- Jane website
- Plan and execute the first surgery properly
- Teamwork works better!

Some live impressions about the course

The Voice of the Faculty

Satyajit Naique (UK): “An older patient has generally a totally different point of view from the surgeon, for us it’s mandatory to understand her/his needs and feelings to obtain the right compliance. What I am trying to transmit to the participants is the human and ethical part of the relationship between older patient and surgeon. From a methodological point of view, I invite the group to question, to share doubts – the role of the chairman in a seminar like this is more or less that one of a team leader (a mixture of competence and humility), trying to keep their attention high along the entire length. Regarding the program, it is very good and well organised.

Roberto Civinini (Italy): “There has been a very good interaction with the participants and the faculty, and a highly constructive team work. Sometimes showing live the surgical procedure on cadavers may be risky, but troubleshooting can be positive to learn by errors”.

Massimo Corain (Italy): “A high level course, perfectly organised. There is an absolute necessity to focus on fragility fractures. The mutual collaboration among public health system, academic world and private companies is strategic, becoming more and more essential, as it can offer significant results in terms of innovative and better therapies”.

Thomas Gausepohl (Germany): “Hopefully they were all very interested. They wished to complete their knowledge and experience, and intervened a lot. The number of participants was just right to keep track of what they were doing in the labs. Wet labs were extremely appreciated. I personally would implement the practical sessions, with less theory: 30% theory, 70% wet lab. I think that also bad cases are didactic opportunities, it is important for a surgeon to learn by error, to share and comment the negative outcome, trying to analyse and understand why it happened”.

Luigi Residori (Italy): “A fundamental course on fragility fractures, with the involvement of a geriatrician for his crucial, central and growing role. It is important to send the right messages to the surgeons. In Verona, in our hospital we treat about 520 older patients’ fragility fracture per year – 1.5 per day. An older patient is a frail and complex patient, she/he needs a co-managed model of organisation to be compliant, recover properly and move again”.
The Voice of Participants

“I found the course very interesting, even if I generally don’t do external fixation (we often use internal fixation also with displaced fractures). It gave me new tools. Perfectly organised. Wet lab was a great opportunity for us to put in practice what we learned”.

“A very interactive course, well organised, I did appreciate it. The Faculty was very friendly. The wet lab was an optimal opportunity for all of us”.

“Very promising devices and tools. Very interesting the new technique on how to treat proximal humeral fractures. I am not afraid to be a pioneer, nor am I afraid of new tools. The course was very well organised; it is not common to have a wet lab!”.

“The elbow and shoulder sessions were much appreciated. Blonna and Gausepohl were both very clear, innovative and inspiring teachers, focused on complex clinical cases and best solutions. The session on hip fractures in older patients was too simple to me, may be more suitable for younger surgeons”.

“A very interesting course, with a good level of interaction. The teaching method applied by prof. Gausepohl was the one I appreciated more. He decided to start with some practical examples and clinical cases, then let the theory follow. It could be helpful for us an app as reminder tool that Orthofix might plan and deliver, with a refresh of the products’ indications - what to use in certain cases and why, types and measures of pins, screws, wires and so on”.

“A really useful course. I know Galaxy Fixation system well and I use it: a great product, versatile, simple to apply, especially in emergency and even with not very experienced surgeons. But I found the product Chimaera very interesting and promising for its sliding screws and its adaptability to different types of fractures”.

“A valuable course. The technical presentation of Chimaera with tips and tricks was very well done. I consider fundamental to understand what changes in an older patient, who is a different kind of patient, with special needs and frailties, which must be considered before and after surgery. In all main hospitals there should be a geriatric orthotraumatology, as there is a paediatric orthotraumatology”.

“These courses fill the gap between theory and practice that our Universities don’t do. I found it very educational and inspiring, also exchanging different experiences and visions with international colleagues”.

“Very useful to exchange different views, and particularly appreciated the wet lab with technical learning. It would be great to receive the course report, maybe also the raw materials and slides from the speakers, the references”.

“Great the two elbow and shoulder lessons. All presentations were of a high quality. A very good experience, I would suggest the course to my colleagues”.

Text: Patrizia Salvaterra
# TRAUMA FRAGILITY FRACTURES

19–20–21 March 2018 - ICLO Anatomical Laboratory + Orthofix Education Centre, Verona, IT

<table>
<thead>
<tr>
<th>TITLE</th>
<th>AUTHORS</th>
<th>JOURNAL</th>
<th>HYPERLINK TO PUBMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Authors</td>
<td>Journal/DOI</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Authors</td>
<td>Journal</td>
<td>DOI</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Title</td>
<td>Authors</td>
<td>Journal</td>
<td>PubMed ID</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Topic</td>
<td>Author(s)</td>
<td>Journal/Website</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
### Periprosthetic Infection in Joint Replacement

*Dtsch Arztebl Int.* 2017; 114(20):347-353.  

### Serum Albumin Predicts Survival and Postoperative Course Following Surgery for Geriatric Hip Fracture

Bohl DD, Shen MR, Hannon CP, Fillingham YA, Darrith B, Della Valle CJ.  

### Red blood cell transfusion for people undergoing hip fracture surgery

Brunskill SJ, Millette SL, Shokoohi A, Pulford EC, Doree C, Murphy MF, Stanworth S.  

### Skeletal Trauma

Browner BD, Jupiter JB et al. Eds.  