Uncharted Territory; An Open Letter to my Fellow Plastic Surgeons Regarding the Ilizarov Method

Joseph D. Welch, M.D.

Интерпретация с английского языка Каргопольцевой Галины

The day before I left Everett, Washington to go to the ASPRS/PSEF/ASMS meeting in Boston in October, 1990 I said to my wife and also my nurse that I was going to try to find what was “new” or “hot” in plastic surgery. In the early 80’s I had heard of liposuction and had seen a few articles but, as it turns out, I quite wrongly predicted that it would be fraught with complications and probably wouldn’t work very well anyway. As a result I didn’t start doing any liposuctions in my practice until 1987, and I missed out on the fun of the developments in that area of plastic surgery and feel somewhat lacking to this day in that area not to mention chagrined about my own judgement. Nonetheless, I embarked for Boston to seek the future!

Like all of my colleagues, I wandered the Hynes Convention Hall going from booth to booth looking at everything from liposuction cannulae with ultrasonic capabilities to computer software to get my office and my life in order. Had I seen the future? I didn’t know... maybe.....?

Then, on Tuesday, I checked my schedule and noted that I had signed up for Dr. Gavriel A. Ilizarov’s instructional course for Wednesday afternoon. Like most physicians, I suspect, I have a large number of what I call “fliers” cross my desk. These are the journals and newsletters that I don’t ever remember asking to receive. Somehow my name and address have found their way to someone’s data bank and I suppose I am doomed to receive these for the rest of my life, and probably for as long as I need them after death as well. Somewhere in all of these I had seen some orthopedic journals mentioning the “Ilizarov Technique”.

When the ASPRS meeting application arrived I scanned the instructional courses list. After 12 years in practice I look more at the instructors who are giving the courses than at the course titles. Several years ago I took a wonderful course from Dr. Paul Brand on tendon transfers. I took the course to meet the man and to see how he approached the problem. I hadn’t been doing any tendon transfers in my practice, but I thought to meet and see this master was important.

So when I saw there was going to be a course given by Dr. Ilizarov himself, I thought this might be a good course to take. As it turns out, I had quite wrongly assumed that this Ilizarov technique was just another type of external fixation device for lower extremity fractures. I doubted that it would have any application in my practice other than upper extremity fracture fixation which is something that I would ordinarily have my orthopedic colleagues handle, but I signed up for the course anyway.

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Необозначенная территория или белое пятно на карте пластической хирургии

Joseph D. Welch, M.D.

Гений Ортопедии № 2, 1999 г.

История

За день до того, как покинуть Эверетт, штат Вашингтон, я решил поехать в Бостон на встречу Американского общества пластических и реконструктивных хирургов в октябре 1990 года, я сказал жене, что я собираюсь найти там что-нибудь нового и горячего в пластической хирургии. Однажды в 80-х годах я услышал о липосекции и видел несколько статей по этому поводу, но, как оказалось, я совсем неправильно предполагал, что этот метод чреват осложнениями, и, возможно, не даст хороших результатов. Поэтому я не делал липосекции в своей практике до 1987 года и упустил возможность развития в этой области пластической хирургии. По сей день я чувствую какой-то недостаток, не говоря уже о том приговоре, который я вынес сам себе. Тем не менее, я собрался в Бостон искать будущее!

Мне было очень интересно в эпоху компьютерных технологий, когда я ехал в Бостон, чтобы посмотреть, в каких направлениях развивалась отрасль. Я поехал в Бостон, чтобы посмотреть, в каких направлениях развивалась отрасль.

Затем я вернулся к своему расписанию и обратил внимание, что я записал на учебный курс Гавриила Абрамовича Илизарова в среду дня. За 12 лет практики я стал придавать большее значение именам инструкторов нежели называниям курсов. Несколько лет назад я взял прекрасный курс доктора Паула Бренда по пересадке сухожилий. И хотя я не сделал ни одной пересадки сухожилий за свою практику, думаю, что встретить этого мастера и увидеть его подход к проблеме было для меня очень важным событием. Поэтому, когда я увидел, что сам доктор Илизаров собирается дать учебный курс, я подумал, что можно не согласиться с ним. Так что потом оказалось, что совершенно неправильно себе представляя, что Илизаровская техника лишь только другой тип устройства внешней фиксации для...
On Wednesday after lunch I took my place in a meeting room with about 30 to 40 other plastic surgeons and got my first look at the professor. He spoke no English so I had to rely on body language. He appeared very animated, almost cat-like, as he checked projection equipment, talked with Mark Flistein M.D., the interpreter, and moved about the front of the room amongst several American plastic surgeons, including Mike Lewin, M.D.

It all looked rather routine. Mark Flistein M.D., a plastic surgery resident from Albany, N.Y., then took the podium at 2:30 P.M. and began to explain the "ground rules". Because Dr. Ilizarov spoke no English, Mark would read the professor's lecture. Dr. Ilizarov's associate. Dr. Mikhail Sumchukov, from Kurgan, U.S.S.R. would "man" the slide projectors. We could ask questions. The talk began.

The first slides (3 screens with 3 projectors) showed two cortical bone fragments which had been slowly separated with healing bone tissue between them. Several of these early slides reminded me of histology class in medical school... nothing "new" here.

Then he showed some gross and microscopic work from a dog where a vertebra had been removed and some type of external and internal fixation device had been used to induce more bone to grow. I was a bit unsure as to exactly what had been done. Slides of this cute little mongrel dog running around with this elaborate erector set mounted over its back reminded me of pictures that I had seen from the early Soviet space effort. The pictures were in black and white and all of this seemed from a rather distant era. So far I think we all felt we were just taking a first look at the professor. He spoke no English, so I had to rely on body language. He appeared very animated, almost cat-like, as he checked projection equipment, talked with Mark Flistein M.D., the interpreter, and moved about the front of the room amongst several American plastic surgeons, including Mike Lewin, M.D.

The slides were magnificent! Even though we were still looking at still photographs of X-rays we all sensed that an exciting dynamic process was underway. As the medial "hemi-fibula" was slowly drawn medially by the Ilizarov apparatus to fill the tibial gap it laid down an "exhaust diaphysis" of bone in its wake. (I have subsequently learned that this process is called "distraction osteogenesis and bone transport"). The new bone tissue is called "regenerated tissue"[1-10].

At this point a question was raised. "What is an olive wire?" The Ilizarov apparatus contained not only a large heavy external rings and rods, but also a number of delicate thin wires with bulbous thickenings. I don't speak Russian and I don't know Dr. Ilizarov but I jumped to the conclusion that someone in this project had a good sense of humor and they also enjoyed a good Martini with an olive on a toothpick!

In an early part of the course Dr. Ilizarov presented a series of arteriograms following "hemi-fibulotomy" (perhaps... nothing "new" here.

The professor showed us X-rays of a dog's lower extremity where he had removed a long segment of tibia. He then showed a series of X-rays where the fibula had been cut part of the way thru with osteotomies at two levels on the medial side at the level of the proximal and distal tibial defect and then split vertically. Dr. Ilizarov then skwered the medial "hemi-fibula" with two percutaneously placed wires and after two weeks of compression began to distract the medial "hemi-fibula" with his apparatus. Mark Flistein translated this process as "tension-stress"[1-10].

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An X-ray taken after the removal of the apparatus showed an intact tibia i.e. continuity of bone from the original proximal tibial fragment to the distal tibial fragment. I think it is safe to say that at this point my colleagues and I no longer felt we were just taking another course. We had just seen something we had never seen before viz. the closing of a long bone defect without the use of some type of remote bone graft. I also sensed a frenetic movement of pens to notebooks about me.

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This should be called "two level corticotomy?" and the application of his "tension-stress" apparatus. The tension-stress area of the fracture site apparently induced neovascularization of the area with all of its beneficial effects on wound healing. A case was presented of a man with an ischemic lower extremity and ulceration of the tips of several toes. His arteriogram was shown in which there were no anterior or posterior tibial arteries and the popliteal artery ended as a bleak run off into the peroneal vessel. Dr. Ilizarov then showed the results following a tibial split and the application of tension-stress. An arteriogram taken after this process and after the removal of the apparatus showed not only a proliferation of new blood vessels around this area but also the reestablishment of the dorsalis pedis pulse in the leg distally! Dr. Ilizarov indicated that this previously incapacitated man was now employed as a power lineman who walked many miles a day! Given the bleakness of the preoperative arteriogram there was an audible moan of disbelief from the audience.

At this I raised my hand, as did several others, and I asked Mark if the neovascularization on the arteriogram lasted after the Ilizarov apparatus was removed. After several interchanges between Mark and the professor, Mark said "He says that it lasts...THAT'S A FACT". And as Mark spoke, the professor turned to me and he lifted his head to the ceiling and thrust his hands down to the floor in a body motion that said "it doesn't make any sense and I don't understand it...but...IT'S A FACT".

From here Dr. Ilizarov presented a series of pseudoarthroses in young people. These patients had terrible deformities of the distal tibia with significant shortening of the extremity, loss of bone mass, and angulation of the distal segment. Each patient was posed with multiple brick-like blocks to support their shortened extremity with a metric ruler placed in front of the blocks. In some cases there was as much as 32 cm of shortening. One of the course participants seated near me pointed out that the date of each photograph was placed in a wood frame in the corner of the picture with a simplicity similar to the scoreboard at Fenway Park. In one case it read 1966. As Dr. Ilizarov proceeded with his presentation I sensed that he was not showing a "technique"...NO!...he was presenting his life's work with true long-term follow up. This was incredible!

Prior to leaving Everett I had read Dr. Virginia Clark's article concerning some of the difficulties in establishing controlled clinical studies. By Wednesday in Boston I had seen many presentations, and I had the nauseating feeling that many of the reports were totally uncontrolled and probably represented last month's facelift "work" and remarkable innovative "breakthrough". How unique...I reflected...to take a course in which the preop photographs were taken in 1966, the post op photos were taken in 1975 and the presentation was given in 1990. This Ilizarov is in no hurry to publish!

As case after case of the successful correction of terrible non-unions of the tibia was presented and then cured with the Ilizarov apparatus the audience was both awed by the slides and increasingly restless. After the successful treatment of a neglected case of an open fracture of the distal tibia was shown, a series of questions was fired at Mark Fliestein. "Does the professor use a C-arm?" after some interchange..."no". "What about free island transfers to cover those open defects over the non-unions? ...more interchange to translate and to clarify free island transfer, ...answer..."no".

The professor then showed a case of a gun shot wound to the wrist in which all bony support was lost and tendons were hanging out of the wound. My approach to this injury...
would probably have been a plating or pin stabilization of the bone, segmental vascular grafts, and coverage with a flap. Dr. Ilizarov simply collapsed the hand back into the forearm, approximated the vessels and tendons primarily, and suspended the hand and forearm in his apparatus. Then in a few weeks he proceeded to slowly pull the hand out. Why preserve length with all its attendant difficulties when you can grow new length later? In desperation someone asked: "don't you use vein grafts?" "…answer… "no."

At some point in the presentation laughter started to break out. With each slide, and especially with each post op slide, there was more laughter. At one point Dr. Ilizarov seemed to become upset by this and Mark had to stop his reading of the lecture and explain to the professor that we were not laughing at him…, but rather…, at ourselves and at how elegant his solutions to these problems were. "C-arm?" "…nyet!" "Free island transfer?" "…nyet!" "Segmental vein grafts?" "…nyet!" If this is for real we were seeing the obsolescence of 90% of our "knowledge" of the treatment of lower extremity trauma and soft tissue defects. One participant's final gasp was a question about Roux's "law" of bone healing. The professor indicated that "yes this tension-stress and distraction osteogenesis seemed to violate that law." At that point I was sure we had crossed into uncharted territory, Roux's "law" had just been repealed!

Now at this point in the presentation I wondered if this work was really as spectacular as I thought or was I simply making more out of this because I had come to Boston looking for something new? Then two things occurred that convinced me that others also thought this work was significant. The first was when a gentleman in the row ahead of me turned, and in a feeling of the moment said, "this work deserves a Nobel Prize in Medicine." An even more telling second event was when one of the people running the meeting came to the podium about 2 hours into the session and asked the professor and the rest of the group if we wouldn't like to take a break? Through Mark, the professor indicated that he was "O.K." Then the person asked the participants what they wanted and since "this was a democracy" we would take a vote. No one voted for a break and there was a resounding chorus of "no…no…no…have the professor keep going!!" Now, I ask you, "how many courses have you been to lately where, two hours into the course in the late afternoon after lunch, the participants vote not to take a break?" At this point I knew that this work hadn't only struck me because I was looking for something new. This work had substance... this work had fire!

In the final hour we were blown out of our seats with laughter. A series of patients with pseudarthroses was followed by the successful treatment of several cases of what I could only generally describe as "orthopedic disasters." One slide showed a dried tibia sticking out of a neglected one month old wound that arrived from "the outback". This was successfully treated and closed with the "Ilizarov Apparatus" or the "Ilizarov Method", whichever you prefer. Cases of osteomyelitis were successfully closed without the use of flaps and other modalities other than the Ilizarov Method [3-6]. The final dramatic cases showed the treatment of an acondriotic dwarf whose short bowed legs were both lengthened and straightened. Somewhere in these cases the professor even showed the application of this method to a cosmetic problem where a young girl had an asthenic slightly shortened leg. By the use of proximal tibial and fibular splits and distraction osteogenesis new bone was induced thereby creating the illusion of a full gastrocnemius muscle.

At the conclusion of the three hour course I felt both exhilaration and exhaustion, exhilaration at the possibilities of our "knowledge" of the treatment of lower extremity trauma and soft tissue defects...
and exhaustion at the distance I'd covered. During the presentation a number of potential applications of the Ilizarov Method were proposed to the professor. Question: "What about hemifacial microsomia? Could this apparatus be applied to the mandible to lengthen it or make it grow?" Answer: "Stomatologists do this kind of work in the Soviet Union so I have no experience in this area." Question: "What about using this for sternal wound stabilization and closure after open heart surgery? Could ribs on each side of the wound be split off, olive wired, and pulled over the defect?" Answer: "We don't perform open heart surgery at our institution in Kurgan so I don't have any experience in this area." Question: "What about using this technique for pectus excavatum?" Answer: "We haven't had occasion to try this yet."

At one point someone asked the professor if he had many complications with this procedure. He indicated that early on in his experience he did, but he had learned how to avoid them. He then emphasized the importance of studying the technique under formal instruction before embarking on any cases of our own. Then he interrupted Mark Flistein and somewhat impulsively added with a sly smile "you show me the surgeon and I'll tell you what complications he'll have!" Ah yes!...it seems that "surgery", at least, is an international language.

As a few of us gathered about the professor and Mark Flistein after the presentation, we asked each other questions: "Why didn't the olive wires come loose or get pin tract infections?" "Were these devices really as durable as they seemed to be with patients driving tractors and riding horses with their appliances in place?" "Could this technique really cure osteomyelitis without traditional approaches of debridement, bone grafting, plating, muscle or free flap coverage?" That night I had the distinct feeling that I had come to Boston to find the future, and I had! I now looked forward to the next day's major event.

**Dr. Ilizarov was scheduled to give the PSEF Malinich Lecture at 8:00 A.M. and I presumed that he would present an abbreviated version of the previous day's three hour instructional course. This time I would be able to not only hear it again but I would also be in a position to observe my fellow plastic surgeons' reaction to his presentation. Before the lecture, as we filed up to the lecture hall I encountered several of my old buddies. Most notable was Steve Blackwell, a co-resident with me 15 years ago in Galveston, Texas. Steve had just been named the first Steven R. Lewis, M.D., Professor of Plastic Surgery at the University of Texas, Galveston Branch, on Tuesday night at the Harvard Club. I pulled Steve aside and said rather boldly and quite presumptuously, given his new position, that what he was about to hear would obsolete 90% of our current thinking on the treatment of lower extremity trauma. And I went even further to say that I was convinced that this next one hour presentation would unleash a torrent of American plastic surgical innovation that would sweep away our current techniques and make the explosion of techniques that followed Dr.Illouz's liposuction presentation pale by comparison. Given this build up, Steve and those sitting around me were "pumped" to hear the presentation. Now that I had put myself "out on a limb, I hoped the presentation would be as good as the day before."

The presentation was being given in a giant convention hall with the professor up on a stage. Unlike the previous day's talk in a small side room of the hotel, this was going to be a big lecture. Given my build up to Steve and the others, I now had some doubt as to whether his talk would have the same impact given the different format and the shortened

gda один участник сказал, что эта работа заслуживает Нобелевской премии в медицине. Второе, ещё более говорящее о важности Илизаровского сообщения, когда один из сотрудников, проводивших этот курс, после двухчасового заседания спросил, не пора ли сделать перерыв, то по закону демократии мы проголосовали. Никто не поднял руки за перерыв под громогласный хор: "Нет, нет, пусть профессор продолжает!" Много ли у нас было курсов, когда участники после двух часов работы вечером не взяли бы перерыв? Эта работа и есть то нечто новое и горячее, чего я так ждал. Она была настолько горячая, что по существу зажгла всех!

В течение заключительного часа зал гудел. Серия пациентов с локшими суставами и остеомиелитом, которые я мог только в общем описать как "ортопедическую катастрофу", была успешно вылечена аппаратом Илизарова без использования трансплантатов и других методов лечения.

Важность применения аппарата Илизарова для решения косметических проблем была показана на двух примерах. У карлика с ахондроплазией его короткие дугообразные ноги были удлинены и выпрямлены. У молодой девушки с асценцией укороченной ногой было сделано растяжение большеберцовой и малоберцовой костей, и после дистракционного остеогенеза новая кость создавала впечатление полной икроножной мышцы. Потенциальные возможности метода Илизарова оказались весьма разнообразными. В стоматологии - для удлинения нижней челюсти при гемимикросомии, в хирургии сердца - для стабилизации стернального дефекта после торакотомии, в ортопедии - для коррекции воронкообразной груду. Кто-то спросил профессора, много ли у него было трудностей с его приспособлением? Профессор ответил, что в начале его работы - были, но сейчас он научился избегать их. И добавил с лёгкой улыбкой: "Покажите мне хирурга, который не встречал бы на своём пути осложнений? Хирургия интернациональна в смысле трудностей и осложнений!".

Мы спрашивали друг друга: "Неужели это приспособление настолько практично, что для работы с ним пациенты могут водить трактор или ездить верхом на лошади? Почему струны с напайкой стабильны, не проскакивают ли они в спицевой канал, не вносят ли они инфекции? Может ли эта техника лечить остеомиелит без традиционной костной пластике, пластики, мышечного и кожного трансплантата? Стимулирует ли этот метод рост кожи, мышц и нервов?" В заключение трёхчасового курса я чувствовал одновременно и радость и изтощение: радость от возможностей, истощение от расстояния, которое я преодолел.

На следующий день была назначена ещё одна лекция доктора Илизарова. Я подумал, что это будет сокращённый вариант предыдущей лекции, но по тому, что мы собрались в огромном
time.

After Dr. Mike Levin's introduction of Dr. Ilizarov, Mark Filstein began to read the lecture. As I had expected, this presentation followed the instructional course given the day before. It started with the same histologic slides of the healing bones and after several more of these slides I could sense that those about me were looking at me and thinking "Welch has completely lost it. This is rudimentary histology lab 101!".

But as the presentation continued I sensed that at one point they too began to feel that this work was something special. I think it was the slides of the dog where a long segment of tibia had been removed and then replaced by a segmental hemi-fibulotomy and distraction ostegenesis that I sensed that they were taken with as well.

Now... I had the pleasure of knowing what was going to happen next... I imagined that I was not sitting through a medical presentation but rather that I was watching a Russian grandmaster of chess at work. His opening moves seemed routine...nothing brilliant here. He then built slowly from there and again... nothing seemingly new. But then, a move... then more moves... what was he doing? This looked too risky! This was bizarre!! Could this work? Where was he going...? Then move after move...brilliant innovation...unprecedented... then checkmate. And then again...more innovation...more strange moves...checkmate again! Pseudoarthroses...cured! Osteomyelitis...cured! Dwarfism and leg length discrepancies...cured! At the conclusion of the presentation there was a standing ovation and I felt we had just marked a milestone in American plastic surgical history.

What a presentation! What a human interest story. I had been told the day before that Dr. Ilizarov had originally gone to Kurgan as a general practitioner and some of my co-attendees and I imagined that he had been faced with the treatment of severe trauma in a relatively isolated area. Given this situation, he became essentially a self-taught orthopedic surgeon, and perhaps because he did not have the benefit of formal training, he embarked upon treatment modalities which "violated basic laws of bone and wound healing." In this case, a lack of formal training, given his innovative mind, was an advantage.

After the Maliniac Lecture a few of us gathered around the professor again. The professor was perfect for the role. He reminded me of Albert Einstein. Jet black hair shot straight out of his head like electricity. Someone nudged me and pointed to his shoes... black Reeboks. A dark suit and tie completed the outfit.

Now the question was "what was I going to do from here?" Then as I stood in the group I saw a familiar face from the instructional course from the day before. Geoff Buncke, a young tall fellow, was also standing around the professor. Geoff had been seated behind me during the instructional course and had seemed as excited about all of this as I had.

Later, in the hallway, Geoff said two things which I believe really put all of this in perspective. The first thing he said was that after seeing this work no plastic surgeon would approach a complicated wound of the lower extremity without having this technique available in his/her armamentarium.

The second tenet which summarized both days was that in the future, "we'll shrink it... close it... stretch it..." ***

Will it work? Can one really induce new muscle and skin and nerves to grow? [7, 8] Can the principles of distraction osteogenesis be applied to craniofacial surgery? [17-19] Will this be a turning point in American plastic surgical thinking? Will these developments cut across or-

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В Гении Ортопедии № 2, 1999 г.

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We are all deeply indebted to the late Dr. Mike Lewin* for inviting Dr. Ilizarov to be the Maliniac speaker and to the PSEF for making the arrangements for Dr. Ilizarov to come to Boston.

We are all indebted to Dr. Mark Filstein for doing a flawless job of translation.

And, in the spirit of revolutionary Boston, let this letter act as the clarion call to plastic surgery across the land “WAKE UP!!... WAKE UP!!!... BIG CHANGES ARE COMING!!... BIG CHANGES ARE COMING!!”

REFERENCES

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