

Hear and see again with the help of standard parts: Success story of the portable surgical microscope for developing countries.

➔ Dear visitors, today I would like to introduce you to a product in which standard parts have made a special contribution to the success and still do so. It is about a portable surgical microscope that has been specially designed for use in developing countries and I will tell you how the idea came about, show you how it is used and explain what the standard parts are all about.

But first I would be interested:

➔ What do you do when you have earaches today? E. g. due to inflammation of the middle ear.

You may try it first with an onion sack, you go to the doctor of your choice, you may get an antibiotic and after a few days everything has recovered.

➔ What if it gets worse? Then you go to the hospital and, in extreme cases, you end up in surgery. That's what it's like there, mostly known.

➔ What does someone in a developing country do if he or she has earaches?

He can take it for a while now. At some point you may find the witchdoctor and he tries his luck. Mostly by questionable means. It is not uncommon for things to get worse.

➔ The nearest clinic is in the city, it's too far to drive and - because sick - too burdensome and most people don't have the money for treatment either. In addition, it is also lacking in all corners and is not necessarily inviting.

➔ The operating theatres are just as untrustworthy, which means that there will be a lot of movement to avoid landing here. Who knows how this would turn out in the end?

➔ A relatively blatant contrast between here and there and ethically not really okay. What can be done about it?

Bring equipment from here, through any aid agencies? Is well done, often even donated directly by the industry.

Mit Hilfe von Normteilen wieder hören und sehen:
Erfolgsgeschichte des portablen OP-Mikroskops für
Entwicklungsländer

- Von der Idee zur Realisierung
- Nutzen und Anwendungen weltweit
- Normteile im Engineering und Teilnahme am Deutschen Normteile Award



➔ Only what happens to the devices there? First of all, they have to be able to deal with it and this is not always easy with the highly complex medical devices. Operating instructions are there, but who reads them or understands them?



➔ If it succeeds, they work with it for a while and at some point the good piece falls out. For example, due to a defective fuse or lamp. They don't have a maintenance contract and can't afford an expensive service. They are not able to repair it themselves; the device lands in the corner and gets dusty there.



And even if it does work for a longer period of time, they are always dependent on a continuous power supply that is not necessarily available.

➔ So: There is a certain problem here.

Do what?

Our answer is: Build something suitable!

We did it and the initiative came from an ENT physician in 2010, who needed four full hours instead of the usual 20 minutes for a routine operation in a charity operation in Southeast Asia's Myanmar due to a lack of a proper microscope, and who also, had to expose the patient to a high risk.



➔ You have to imagine that with such a middle ear surgery the surgeons dig a proper hole in the skull and they have to work their way cautiously past the facialis, the facial nerve, because if you injure the facial nerve, the patient can be half-sided facial paralysed.

This doctor told me he can't go there anymore, as long as he can't bring his own travel microscope, which was not available anywhere else.



➔ He said that one should develop a device that is reduced to the essential functionalities, built so light and small by means of downsizing that it is transportable and then still functions independently of a constant power supply - at least temporarily. In addition, it is so inexpensive that it is either affordable for the local clinics there or it can be brought along by the relief NGOs who make missions there.

Forderungen:

- * auf die wesentlichen Funktionalitäten reduziert
- * mittels Downsizing so leicht und klein gebaut, dass es transportabel ist
- * unabhängig von einer konstanten Stromversorgung - zumindest zeitweise -
- * so preisgünstig, dass es entweder für die dortigen Kliniken bezahlbar ist oder von den Hilfs-NGOs, die dort Einsätze machen, mitgebracht wird.

Well, that was the claim. And what's this thing supposed to look like?

We had no real idea at first.

What do you do nowadays when you have no idea? You google.

→ We found an internet auction where we bought a used, large surgical microscope. That's what we took and completely dismantled. Studied how this and that was built into functions and thought about what could be made smaller and lighter or omitted altogether.

An ophthalmologist experienced in Africa told us that we should definitely install a rechargeable battery and that we should be able to operate the device with a car battery. Electricity from the socket is not permanently available anywhere in the world, he said.

→ Then we developed and designed.

It was clear from the outset that it would not be possible to produce the microscope as a niche product in any large series, with the result that production parts will generally turn out to be expensive. It was therefore important to make it as simple and inexpensive as possible and to keep the required number small.

→ Instead, as many functions as possible should be implemented with catalogue parts and standard parts, without compromising usability and design. The thick catalogues of the well-known standard parts suppliers remained permanently open and this and that was tried out and sample parts were requested via CAD download. With the importance to keep an eye on the price.

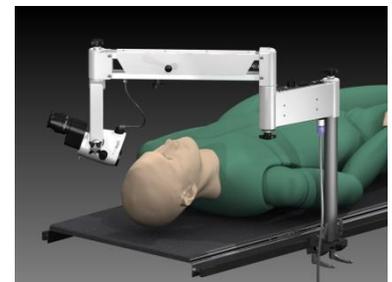
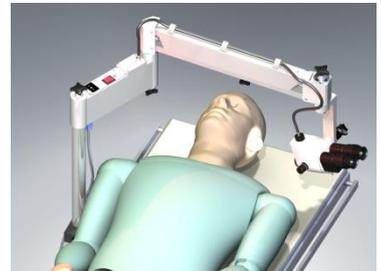
→ The result is a transportable surgical microscope, initially for ENT and later also for ophthalmologists, which has been specially designed for mobile use in a non-technical environment and still has the essential functions of a conventional surgical microscope. Stowed in an aluminium case with hand luggage dimensions to take wherever you go.

→ With this device it is possible to treat people in remote regions of the earth and carry out urgent diagnoses or operations in the middle and inner ear or even eye surgeries. This makes it a substantial piece of equipment for physicians working in regions where:

- medical care is rarely provided,
- medical-technical facilities are not or hardly existent,
- emergency relief operations are required at short notice
- and/or where a reliable power supply is not ensured.

→ And this is what the prototype looked like.

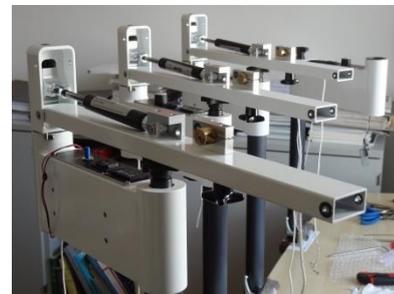
With this device we went in November 2011 to Yangon and Mandalay in Myanmar. A 14-day surgery workshop with four German and two Burmese ear, nose and throat specialists as well as other anaesthesiologists was scheduled and the microscope had to pass its first test.



→ Everything went well for the most part and the operation days in Mandalay even had to be completely powered by a car battery. It was also planned to use a large piece of equipment provided by the German manufacturer, which was not released in time by the customs authorities and was therefore not available. Thus, our microscope spontaneously became the most important instrument for the surgeons during these two weeks, in which about 40 patients could be treated operationally.



→ Since then we have continued to develop the microscope further and built it in small series of 5-8 pieces, currently we are in the 5th generation. Inspired by feedback from the users, small details have been changed or supplemented time and again. Or even fixed weak points.



→ The devices are now in use worldwide, 12 in Africa, 5 in Asia and 2 in Oceania. And if you look at the suitcase in this light, it is also believed that they are often used for so-called outreach camps, where doctors treat patients in rural areas far away from the clinic in the city.



On the basis of a few selected examples, I would now like to show you how to use the device:

→ The girl you see here is called Esnat, she comes from a village near Lusaka in Zambia. Look at the right side of this girl's face. You take your left. Do you see the swelling on your ear? She has a very advanced middle ear infection and the swelling is caused by the fact that everything is full of pus. This stage of inflammation is a process of several weeks, which hurts terribly. Many of you know what earaches feel like. Especially at night.



→ With us it is a visit to the doctor, there is the mentioned antibiotic and the thing has changed after a few days. In these countries, however, there is simply no ENT doctor or pharmacy around the corner. This means that the inflammation grows and thrives.



And if such a full-grown inflammation is not treated as soon as possible - and this can only be treated with surgery - it will eventually lead to death.

→ My second example is this boy from Rwanda. Many of you know this maltreated country from the terrible news of more than two decades ago. I was at the ENT clinic in Kigali almost two years ago - there are only two hospitals in the whole country with ENT and I thought when I saw him, my boy you're wrong here, you need an ophthalmologist.



➔ But it turned out he had a nasal sinus inflammation -again far advanced and pronounced. For several weeks. This aggressive focus of inflammation has already eroded through the bony interface between the sinus cavity and the ocular cavity, dissolving the bone, and now pushes out the eye, which in turn pulls itself at the optic nerve.



➔ What else can you do but to operate the boy immediately? No alternative. Otherwise he loses his sight.



➔ The third example now actually comes from eye medicine:

The risk of being visually impaired in developing countries is always twice as high, especially for children. On the one hand, of course, if the child can only see poorly or not at all, and attendance at school is extremely unlikely, on the other hand, however, because it is typically the children who have to watch out for the blind grandma or grandpa instead of going to school.



➔ Ladies and gentlemen, you have all heard of the so-called cataract. Of the 39 million blind people worldwide, around half suffer from cataracts and 90 per cent of them live in developing countries. In this eye disease, the lens becomes cloudy and gradually leads to blindness of the eye. Usually, however, there is a sign of aging at birth or can occur after an injury to the eye.



➔ However, people who have been blinded by cataract can be treated with a simple operation. The natural lens, which has become opaque behind the pupil, is removed and with the implantation of an artificial lens the patients can see again. For this operation, the doctor needs an operating microscope, a large one or one like the one we build.



Three individual examples of the microscope application.

→ You're starting to wonder why he's telling us all this? What's that got to do with this event here?

I think there's quite a lot. This is the intensive use of standard parts in this product.

Initially, standard parts are particularly predestined here because they are proven machine elements and reasonably priced. In addition, they are visually and haptically appealingly designed in the form of handles, clamping levers or operating elements and give the product a high-quality appearance.



→ A very important aspect for our microscope project is the procurement of spare parts. Even if you assume that nothing should wear out or break anyway, there is still the misuse, the crash due to carelessness or simply the loss of components, which requires a replacement. Managing repairs over long distances to Africa or Asia is a special challenge. However, if it's just a matter of replacing a missing standard part, it simply costs us an e-mail or a phone call to Ganter and in no time the clamping lever on the other side of the world is ready for use.



→ All electrical or electronic components are mass-produced and you can order the battery from Amazon if you like. Replacement is easy, all cable connections are plugged in, and you do not need an electrician in general.

Now one would almost like to think that everything has been thought of with these devices. But this is not the case at all and it was a long way with many setbacks and improvement loops.



→ An initial experience was that the microscope for ophthalmologists has to be positioned much higher than the ENT, simply because the ophthalmologists look their patients lying on the operating table from above into the eyes and not sideways into the ears like the ENT surgeons. The means of choice was an optional extension piece for the stand column, but unfortunately hard to see on these two photos.



But even this is not always enough when you look at the right picture of an eye surgery in Uganda. It was necessary to operate on an elderly woman who could not lie flat because of a strongly bent spine. As a result, the doctor also needed a cushion for his stool. The only bad thing about it was that he could no longer reach the foot pedal on the ground for fine focusing.



➔ It is sometimes even more adventurous with the supports, as here at this ophthalmologist in Tanzania, where a board is simply pushed under the shoulders of the patient for a better hold of the microscope. And because there have been complete crashes at one time or another there has recently been a decent floor stand for the microscope in various variants.



However, it is not always only the doctors in developing countries who are experiencing difficulties with the microscope.

➔ I can tell you a nice anecdote from a German professor who performs throat surgery in Tbilisi, Georgia with our microscope. After he had been there for a week I asked him after the return how he had been. "Quite badly," he reported, "we were only able to operate with the greatest effort because the microscope could not be brought into the required position. We had to stop again and again because the operating room nurse, who then had to bend the tripod accordingly, could no longer hold it." I couldn't understand all of this at first, but the solution to the mystery was that he hadn't solved the locking button, which is necessary for storing the microscope in the case. He just didn't notice.



➔ Since then, we have been using the color "Brilliant Red" for this button. Available at Ganter without extra charge. Not to be missed! So: This product would not exist without the increased use of standard parts. It would simply be too expensive because it is produced in a small number of copies.



➔ And because we are so convinced and enthusiastic about the use of standard parts, we took part in the competition for the German Standard Parts Award 2017 and promptly won the first prize. This was in the fall of last year and marked a new highlight in the development of this product. One of the reasons for this is that the price was linked to a cash bonus, which we immediately invested in the financing of a ➔ microscope for an ophthalmologist in Papua New Guinea. With additional generous donations from Ganter and CADENAS as well as other donations, this doctor can now be equipped with a device and treat his patients scattered across the country.



Well, the story goes on and I'm pretty sure there will be a lot of exciting things waiting for us.

➔ But for the moment, ladies and gentlemen, I am pleased about your interest and thank you for listening. If you feel the need to get involved here as well, I would like to recommend the association "Eagle", which collects donations for microscopes and watches over their appropriate use. Eagle-ent.org.



Thank you very much.

Jakob PrechtI, 2018/03/08

Danke schön