DOI azonosító: 10.17625/NKE.2015.008

NATIONAL
UNIVERSITY OF PUBLIC SERVICE
Doctoral Committee

Lt Col László FEKETE, MD

Electro-gastro-intestinography (EGIG): a new non-invasive method for monitoring abdominal functions in operational areas

The author's summary and the official reviews of the PhD thesis

Budapest
2014

NATIONAL UNIVESITY OF PUBLIC SERVICE

DOI azonosító: 10.17625/NKE.2015.008

Lt Col László FEKETE, MD

Electro-gastro-intestinography (EGIG): a new non-invasive method for monitoring abdominal functions in operational areas

The author's summary and the official reviews of the PhD thesis

Supervisor: Col Prof. dr. József SOLYMOSI (R), DSc.

Professor Emeritus

- 2014 -

DOI azonosító: 10.17625/NKE.2015.008

1. **DEFINITION OF THE SCIENTIFIC PROBLEM**
2. **RESEARCH OBJECTIVES**
3. **RESEARCH METHODS**
4. **BRIEF SUMMARY OF THE RESEARCH BY CHAPTERS**
5. **SUMMARY OF CONCLUSIONS**
6. **NEW SCIENTIFIC RESULTS**
7. **PRACTICAL UTILISATION OF THE FINDINGS OF THE RESEARCH**
8. **RECOMMENDATIONS**
9. **LIST OF THE DOCTORAL STUDENT'S RELEVANT PUBLICATIONS**
10. **THE DOCTORAL STUDENT'S PROFESSIONAL-SCIENTIFIC CV**

Budapest, 09. 10. 2014.

signature

DOI azonosító: 10.17625/NKE.2015.008

1. DEFINITION OF THE SCIENTIFIC PROBLEM

The decades following World War II gave rise to a series of different war concepts. The doctrines of the total nuclear warfare, the limited nuclear warfare and the flexible military response are all well known. In these concepts the newer and newer generations of nuclear weapons had the leading role.

In the final years of the 20th century scientists who rejected the general nuclear war using the achievements of the scientific-technical revolution developed newer and newer generations of traditional weapon systems, the aim of which beside their increased target acquisition was to multiply their annihilating, destructive harmful effects.

The danger of a global military confrontation was possibly gone, but new hazards of different directions and sources emerged. These are the claim for power and territory, the national, ethnic, religious tensions, the economic crisis, the international organised crime and the terrorism, which is also present in our region.

The technological development of the last decades, the natural disasters and the continuous wars going on at several parts of the world open new possibilities on the one hand, but give rise to new unsolved problems on the other.

The war and disaster doctrines created in the second half of the 90's prescribe the standards characterising peace time especially the time norms concerning medical care. The well-known concept of „golden hour" became one of the regulations in the medical treatment of casualties. According to these concept casualties has to receive the first medical (surgical) treatment within one hour.

These days in Western Europe with its well organised and concerted attacks international terrorism poses the greatest danger. Despite the fact that fortunately terrorist attacks are very rare in Hungary, organised crime groups are more and more liable to use explosive devices to fight each other. With the spread of international terrorism Hungary has become one of the possible targets.

Technical development could not curb the forces of nature; natural disasters are part of our everyday life. Though some of them can be forecast, generally we have very little information about their exact intensity.

In the light of the above we can state that both in peace time and under extraordinary conditions members of the medical service have to manage the treatment of a huge number of people with multiple injuries often in panic in unexpected situations. Anthropogenic and/or

DOI azonosító: 10.17625/NKE.2015.008

human disasters can happen anytime and anywhere most often far from the vicinity of medical hospitals, therefore every medical expert has to be aware of the most important tasks to be tackled in these circumstances, since this is the only way to achieve the least possible loss and damage.

Let me share some thoughts about the doctor in the middle of the chaos of the treatment of injured masses. Medical treatment needs active thinking. There is no time for collecting data standing next to the patient's bed then considering possibilities leaning back in an armchair. As soon as he sees his patient the doctor, judging by the visible signs can recognise two-three diagnoses in most of the cases. We can say that doctors mostly need simplification, heuristics.

A surgeon is also faced with the serious ethical responsibility of decision making, when he must decide about the fate of people. If he does not operate he can be condemned for breach of duty, for failure to provide aid and saving of life, while if he operates on a patient in hopeless condition or if he uses an unusual or brand new method he can be accused of experimenting and of needlessly operating on a patient beyond hope of recovery.

When making a decision the surgeon is totally on his own. Even if he asks for the opinion of his colleagues, even if he prepares the procedure and has the right theoretical basis for the intervention, even though the operation is a teamwork the responsibility always lies with the surgeon performing the operation where stands completely exposed and alone. On top of this his conscience carries the weight of the responsibility of the decision over the fate of people. What he does must be ethical and to the best of his knowledge.

The electro-intestinogram (EIG), together with the electro-gastrogram (EGG) form a non-invasive method complex which ensures the continuous activity of the gastro-intestinal system making possible its monitoring without disturbing the patient and also allowing to assess whether some of its malfunctions need acute or elective intervention. Furthermore the results of earlier (medicinal and/or surgical) interventions can also be checked. In addition it can be used to support the 'golden hour' concept according to which decision must be made whether the injured or the patient with acute symptoms needs immediate emergency intervention.

The topic of my research consecutively is the development of a new procedure and a set of instruments which dominantly serve the monitoring of the gastro-intestinal tract, and which can be used both pre-hospitally and clinically in peace time, in war time and in extraordinary conditions.

DOI azonosító: 10.17625/NKE.2015.008

Acute abdomen is the abdominal pattern which starting suddenly and demonstrating a fast progression can threaten life. Its importance besides being life threatening is also emphasized by the fact that it is rather frequent. In Hungary it accounts for 25% of the surgical cases. The success of the operation is determined by the time factor, since after the 'golden hour', after two hours the expected rate of recovery is 90%, after four hours 67% and after 12 hours only 25%. What is even more alarming is that with passing of time the rate of complications increases exponentially. It is a generally accepted fact that the difference between the results of the best and the worst surgical treatment is smaller than that of the early and late operation.

Having studied sporadic data from specialized literature I came to the conclusion that the electrophysiological examination of the gastro-intestinal tract and the information gained from the adequate mathematical and statistical analyses of the results can be of immense help to the medical staff examining and treating abdominal and acute abdominal clinical patterns.

2. RESEARCH OBJECTIVES

1. The main objective of the research is to prove that electric signals from the gastro-intestinal tract can be recorded with the help of external electrodes fastened to the abdominal wall and/or other surfaces of the body and that these signals correspond to the current motility processes in progress there. Based on this the aim is the development of a new procedure and a set of instruments which serve the monitoring of the abdominal functions, and which can be used both pre-hospitally and clinically in peace time, in war time and in extraordinary conditions.
2. In accordance with this the purpose of our experiments and examinations is to test the electro-intestinogram both in physiological and pathological conditions. To attempt to record a unified (specific to an anatomic unit) set of signals similar to the EKG in the different parts of the gastro-intestinal tract through both intramural electrodes and electrodes fastened to the skin of adult patients whose gastro-intestinal movements are not affected by their illness.
3. My purpose is to prove that the signal recorded by the non-invasive method corresponds to the signal of the invasive method as a consequence of which the former could also be used to examine further physiological and different pathological conditions of the intestinal tract.

DOI azonosító: 10.17625/NKE.2015.008

4. I intend to use animal tests to prove that signals detected through intramural electrodes are not different in their characteristics from those I recorded by electrodes fastened to the surface of the body.
5. My purpose is to determine the characteristic frequency spectrum of the different parts of the gastro-intestinal tract.
6. I examine if different patients subject to identical enteral stimulation will demonstrate enteral answers of identical characteristics.
7. My task is to find the method of analysis which best demonstrates the changes of the recorded electric signals.
8. I intend to answer the question if the result of the analysis of the signals transmitted through the electrodes introduced in laparoscopy in human examination - similar to the pre-clinical examinations – differs from that of the signals of the electrodes fastened to the surface of the body.
9. I wish to prove that the electric signals of the gastro-intestinal tract detected in anesthesia do not differ in their character from those that can be detected in non-anesthetised state.
10. I examine if the electric signals recorded after enteral stimulation during measuring differ in their character from the physiological reactions.
11. I examine by clinical measurement/s if the lack of anatomic units removed from the gastro-intestinal tract causes appreciable change in the character of the electric signals.
12. I examine with prolonged examination time if the electric signals detected with the help of external electrodes correspond to the current motility processes in progress.
13. I intend to examine if there is a dominant frequency and/or dominant performance characteristic of the patomechanism of the process.
14. Proposition for the further testing of the developed method and device in accordance with the level of medical care of the Hungarian Defence Force.

DOI azonosító: 10.17625/NKE.2015.008

3. RESEARCH METHODS

As a first step I prepared a research plan, which was followed by its detailed execution. I analysed studies introducing the structure and the operation of medical security. As a leading surgeon in KFOR I had the opportunity to gain insight into the medical treatment of ill/injured patients in international operations on ROLE-3 level.

I collected sporadic data and references in specialized literature from libraries and relevant studies on the internet. During my research I continually consulted the research group involved in the development of the measuring instrument and the programmer statisticians who provided substantial help in evaluating the data.

I had regular consultations with the representatives of the group carrying out the pre-clinical tests. The main theater of the human examinations of the research was the 1st Surgical Department of the Hungarian Military Hospital and Health Centre, where I had the necessary human test material and the data recording devices at my disposal.

Before the invasive measurements we applied for and were granted the Permit of the Regional Committee of Ethics.

I published the new scientific results which I found in the course of my research in scientific publications and I also presented them in lectures I gave in different conferences.

Having processed, organised and evaluated the documentation of the necessary theoretical, experimental and clinical material I prepared my thesis.

4. BRIEF SUMMARY OF THE RESEARCH BY CHAPTERS

The second chapter of my thesis is the analysis and evaluation of the relevant Hungarian and international scientific literature. Within this I give a detailed introduction of the following.

The first sub-chapter introduces the development of the treatment of the injured parallel with the historical periods and the evolution of the different forms of warfare. I also give an overview of the healthcare forced to develop in the course of the evolution of the different forms of warfare. .

DOI azonosító: 10.17625/NKE.2015.008

In the second sub-chapter I examine in detail the diagnostic possibilities of the abdominal clinical pattern from the physical examination to the sophisticated, expensive imaging.

The third sub-chapter gives a comprehensive picture of the acute hypogastric clinical pattern; I give a detailed introduction of the abdominal injury caused by explosion as a model of the acute abdominal clinical pattern. I summarise the elements of the tactics of treating the acute abdominal clinical pattern in peace time.

The fourth chapter deals with the characteristics of the treatment of abdominal clinical patterns in war circumstances with special attention to the different treatment levels.

The fifth sub-chapter is about the treatment of abdominal clinical patterns in extraordinary situations. I introduce the treatment protocol in the pre-hospital and hospital periods and explain the principle of Damage Control Surgery.

The main elements of the first chapter are the experiment parts of my research from the pre-clinical research to the several hour-long evaluation of the spectrum of the signal data recording.

In the course of my research I focused on finding the possibility of the specific practical solution and **I was the first to discover and provide scientific experimental proof that**

- on the one hand external electrodes fastened to the abdominal wall and/or other surfaces of the body can record signals originating from the gastro-intestinal tract, and these signals correspond to the current motility in progress there;
- on the other hand that the signals recorded by intramurally applied laparoscopically placed electrodes are not different from the signals recorded by the electrodes that were fastened to other parts of the body, **consequently signals recorded by the non-invasive procedure correspond to those recorded by the invasive one, and with this I gave scientific foundations to the development of the experimental prototype of the equipment system** of the electro-intestinogram (EIG) and the electro-gastrogram (EGG), together the electro-gastro-intestinography (EGIG) as a new non-invasive procedure for monitoring the abdominal functions, which can continually trace the functioning of the gastro-intestinal tract without disturbing the patient.

Strating from my first recognition that electro-gastro-intestinography (EGIG) as a new non-invasive procedure can be used to continuously monitor the andominal functions, based

DOI azonosító: 10.17625/NKE.2015.008

on my concept for the practical implementation with my leadership we devised and had a professional electro-informatical firm to produce the experimental prototype of the complex hardware and software system, which was used to carry out the eperiments and research at the Surgical Department of the Hungarian Military Hospital and Medical Centre.

The new equipment and the software offer a non-invasive procedure that can continuously monitor the activity of the gastro-intestinal tract without disturbing the patient. The electro-gastro-intestinogram (EGIG) recorded by extra-abdominal electrodes attached to the surface can be a useful new tool in the hands of a surgeon working with the GI system. With this method the malfunctions of the intestinal activity especially those that involve decreased or ceased motoric functions can be recognized without invasive intervention within a very short time, without having to place the patient into complicated machines, and makes it possible to decide quickly whether there is a need for fast intervention.

Due to the small size of the device and the portable (electric grid free) computer technology necessary for its functioning it is possible to make immediate recordings, which can be processed in the field even in combat circumstances, which makes this new technology useful in military medicine too.

With experimental measurements I proved that:

- electric signal originating from the gastro-intestinal track can be recorded by the help of external electrodes attached to the abdominal wall and/or other surfaces of the body;
- the electric signals of the gastro-intestinal tract detected in anesthesia do not differ in their character from those that can be detected in non-anesthetised state;
- the electric signals recorded after enteral stimulation during measuring do not differ in their character from the physiological reactions;
- in the case of the abdomen 1-3 CPM (0,017-0,050 Hz), in the case of the small intestine 9-13 CPM (0,150-0,217 Hz), in the case of the large intestine 2-4 CPM (0,033-0,067 Hz) can be identified with the frequency carrying the information. The maximal activity of the abdomen is at 2 CPM (0,033 Hz), the maximal motorics of the small intestine is at 9-13 CPM (0,15 – 0,23 Hz), while that of the large intestine is at about 5 CPM (0,083 Hz) frequency value;
- the spectrum of the healthy people is similar in character, but it shows a variability characteristic of the individual;

DOI azonosító: 10.17625/NKE.2015.008

- compared to the fasting values in repose the power density spectrums change after enteral stimulation thus showing the changes of motorics.

Having described the examinations conducted I give my own partial conclusion at the end of every chapter and preceeding the scientific results I summarise these conclusions.

My thesis also contains the following elements:

- new scientific rsults;
- recommendations;
- specific recommendations for utilizing the scientific results in practice;
- acknowledgements;
- list of references;
- list of own publications in the research topic.

5. SUMMARY OF CONCLUSIONS

Having checked the relevant Hungarian and international literature, I came to the conclusion that so far there have not been any procedures either in the diagnosis of abdominal injuries or in the therapy that would be able to monitor the processes of the abdomen either in the prehospitalis or in the hospitalis period. Since the state of the patients with abdominal injury is in constant change during their transport between the different levels of medical care and the successful treatment is greatly determined by the time elapsing between the occurrence of the abdominal injury and its therapy (‘golden hour’) this procedure and set of equipment would be absolutely necessary.

In the first phase of my research I/we conducted preclinical animal tests on rats to find out if the signals recorded by contact method form the abdominal organs are identical with the signals recorded on the surface of the skin. The findings of the animal test models corresponded with the data found in scientific literature. In the human tests – after obtaining the etical permit – I conducted simultaneous recordings with the help of electrodes fixed in the abdominal cavity with laparoscopy and with electrodes attached to the skin. In the possession of the results of the research I compiled further non-invasive human test models to test the characteristics of the EGIG. I was the first in Hugary to conduct human research to examine recordings made in the abdominal cavity and on the skin surface. Having checked the relevant Hungarian and international literature, I came to the conclusion that the tests

DOI azonosító: 10.17625/NKE.2015.008

conducted so far were only successful in case of the electric activity of the stomac. Based on the results of my measurements I was the first to determine the electric frequencies characterising the different parts of the gastro-intestinal track. I was also the first to conduct human-clinical EGIG recording and evaluation on healthy young population. I was the first to record EGIG signals in the pathological state of the gastrointestinalis tract of a patient, where later in the possession of the operational findings I could conduct evaluation. I was the first to prepare a several hour long EGIG recording and evaluation in physiological life conditions.

In the examination of the gastrointestinal tract mainly the endoscopic and the imaging procedures have a key role. The latter process is well known radiology. The great disadvantageof these methods of examination is that they cannot provide data on the operation and function of the gastro-intestinal tract (e.g. defecation, etc.).

Since the gastro-enteral tract is simply a long tube, which is turned into a unit with complicated neuro-hormonal regulations it would be an obvious research method to make one of the elements of this regulation measurable. In this complicated neuro-hormonalis regulatory network, the intrinsic plexus form the final common route: every internal and external regulation converge on these neurons and is felt through the modification of the local regulations. Although the production of enzimes and digestive juice is naturally the central element of the functioning of the GI system, the sound is usually monitored through the motility of the stomach and the intestines. The movement of the stomach and of the intestines depends on the contraction of the nonstirated muscle, which in turn is generated by myo-electric changes within the system. This is the reasom why the operation of the GI systemcan be monitored by recording myo-electric signals, because they are the products of the intrinsic neuronic network in the first placethis presenting the internal regulation. Despite of the fact that the electric activity of the stomach has long been examined with the help of the electro gastogram (EGG) (see below) there have been very few attempts made to test the complete GI system by recording continuous and parallel, in order to be able to have a picture of the functioning of the whole system.

Symultaneous monitoring of the complete gastro-intestinal system would make it possible to fast evaluate its soundness and after the operation on the gastro-intestinal tract for the surgeon to check the consequences of the operation. In performing these tasks the non-invasive techniques would be of great advantage, since the doctor can gain fast and extensive information without disturbing the patient.

One of the special applications of these non-invasive techniques is the examination of patients demonstrating acute abdominal clinical pattern in extreme conditions, since it would

DOI azonosító: 10.17625/NKE.2015.008

be possible to gain fast, on the spot information with the help of external electrodes and recording devices attached to the body surface. In these cases the doctor has very short time (the so called ‘golden hour’) to decide how urgent it is to start the treatment of a patient, whether he needs immediate intervention consequently has to have priority within the narrow capacity of transport to the hinterland or his treatment can be delayed.

6. NEW SCIENTIFIC RESULTS

1. Through profound analysis of the relevant Hungarian and international literature, *being the first to come to the conclusion* that the electro-intestinogram (EIG) and the electro-gastogram (EGG) together can be able to continuously monitor the gastro intestinal tract **I created the conceptual basis of both the experimental prototype of the electro-gastro-intestinogram (EGIG) attachable to the body surface by electrodes and the related hardware abd software system as a non-invasive procedure and equipment system.**
2. Through experimental research I ***developed*** *the Electrogastographic Nyograph Examining System then with the help of the Electrogastographic Nyograph Examining System* built by the Experimetria Biomedical Research, Development and Production Ltd. ***I conducted test measurements,*** *in which* **I proved first with animal tests then with human examinations** that external electrodes attached to the abdominal wall and/or other parts of the surface of the body can record the electromagnetic signals originating in the gastro-intestinal tract and these signals correspond to the current motility processes going on there; furthermore that the analysis of the signals recorded by electrodes intramurally applied and fixed in the abdominal cavity with laparoscopy does not differ from those that we recorded with electrodes attached to the skin. With this I **proved that the signals recorded by a non-invasive procedure correspond to the ones recorded by an invasive procedure.**
3. **With my experiments I measured valuable data, which were not known before, and I found the following:** the electric signals of the gastro-intestinal tract detected in anesthesia do not differ in their character from those that can

DOI azonosító: 10.17625/NKE.2015.008

be detected in non-anesthetised state; the electric signals recorded after enteral stimulation during measuring do not differ in their character from the physiological reactions; in the case of the abdomen 1-3 CPM (0,017-0,050 Hz), in the case of the small intestine 9-13 CPM (0,150-0,217 Hz), in the case of the large intestine 2-4 CPM (0,033-0,067 Hz) can be identified with the frequency carrying the information. The maximal activity of the abdomen is at 2 CPM (0,033 Hz), the maximal motorics of the small intestine is at 9-13 CPM (0,15 – 0,23 Hz), while that of the large intestine is at about 5 CPM (0,083 Hz) frequency value; the spectrum of the healthy people is similar in character, but it shows a variability characteristic of the individual; compared to the fasting values in repose the power density spectrums change after enteral stimulation thus showing the changes of motorics.

7. PRACTICAL UTILISATION OF THE FINDINGS OF THE RESEARCH

The new device together with its software offers a non-invasive procedure, which can continuously monitorthe functional activity of the gastro-intestinal system without disturbing the patient. The electro-gastro-intestinogram (EGIG) recorded by extra-abdominal electrodes attached to the surface can be a useful new tool in the hands of a surgeon working with the GI system. With this method the malfunctions of the intestinal activity especially those that involve decreased or ceased motoric functions can be recognized without invasive intervention within a very short time, without having to place the patient into complicated machines, and makes it possible to decide quickly whether there is a need for fast intervention. Due to the small size of the device and the portable (electric grid free) computer technology necessary for its functioning it is possible to make immediate recordings, which can be processed in the field even in combat circumstances, which makes this new technology useful in military medicine too.

It’s worth noting though that the above mentioned experiments only give a general picture about the effectiveness of the system and the equipment, but under no circumstances do they serve as reference for other especially clinical tests. In order to be able to apply a system like this with great certainty and speed it is necessary to conduct an extensive and systematic basic research and to prepare a kind of ‘dictionary’ on the basis of which the doctor working in the department or even in the field can prepare a reliable diagnosis.

DOI azonosító: 10.17625/NKE.2015.008

A further possibility lies in the use of the equipment to examine states in extreme conditions for example when the visceral organs are subject to great pressure and/or where the individuals suffer stress of an unusual intensity. These conditions can be experienced by fighter pilots having to endure 10G during a manouvre. We still know very little about the visco-motoric changes appearing during or after flight so application of the new equipment could mean a substantial advance in this field too.

8. RECOMMENDATIONS

As I have already mentioned in the Introduction Having studied sporadic data from specialized literature I came to the conclusion that the electrophysiological examination of the gastro-intestinal tract and the information gained from the adequate mathematical and statistical analyses of the results can be of immense help to the medical staff examining and treating abdominal and acute abdominal clinical patterns. Today it is a requirement that the standard of the operational medical treatment must be the same as the peace-time treatment regardless of the 'time dependence' of the providers.

In the light of the experience I gained during my experimental research in my view we have to take the following steps inorder to get to know the real diagnostic value of the method:

- For statistic examination it is enough to conduct helthy measurements in order to determine the normal EGIG and its variance. Measurings aiming at standardization must be conducted over as prolonged period due to the individual variability of the response.
- It is advisable, similarly to EKG, to register a unified (anatomic unit specified) code about the diferent parts of the gastro- intestinal tract in pathologis states and to compare the results of this measurings to that of the findings of the operation.
- Naturally, to achieve the desired results it is necessary to conduct concerted, multi-centered studies corresponding to the groups of diseases.
- If the chain of examinations described in detail above is successful the next step would be to try the procedure in theatre, in mikssions and in extraordinary situations. In these circumstances the non-invasive EGIG tests would become part of the chain of treatment starting from the first specialised examination through the duration of the necessary transports to the first decision made by specialists, along with the diagnostic

DOI azonosító: 10.17625/NKE.2015.008

procedures in use nowadays. Its testing in missions would provide substantial data about the applicability of the procedure in motion and would give a perfect model about its use in extraordinary conditions.

- Evaluating the results of the several-hour recording drew my attention to the fact that in stress situations the electric activity of the gastro-intestinal tract changes promptly. Having evaluated the results of statistically adequate number of measurings I came to the conclusion that the method could be connected as a complementary procedure to the poligraphic examination, and it could also provide valuable data on stress enduring capability in the aptitude tests.

DOI azonosító: 10.17625/NKE.2015.008

9 LIST OF THE DOCTORAL STUDENT'S RELEVANT PUBLICATIONS

1. **L. Fekete**, B. Bakity, A. Micskó, Zs. Baranyák, Gy. Bárdos: Non-invasive electro-gastro-intestinogram (EGIG) recording under physiological conditions. *Academic and Applied Research in Military Science 2014: Közzétételre elfogadva* (in press)

2. **Fekete L.**, Nagygyörgy Á., Diamant P. K., Halmy Cs., Zentai Á.: Radialis lökéshullám kezelés szerepe nagyméretű ulcus cruris gyógyításában (esetismertetés). *Orvosi Hetilapba közlésre leadva 2014*

3. **Fekete L.**, Nagygyörgy Á., Diamant P. K., Zentai Á.: Extracorporalis lökéshullám kezeléssel szerzett első tapasztalataink diabéteszes láb kezelésében (esetismertetés), *Hadmérnök 2014: Közzétételre elfogadva*

4. Bakity B., László Sz., Záborszky Z., **Fekete L.**: A vákumasszisztált hasfalzárás (VAC) az ideiglenes hasfalzárás egyik lehetséges alternatívája. *Magyar Sebészet 2010, 63(4):.230.*

5. Záborszky Z.**,** Bakity B., **Fekete L.**, Orgován Gy.: Hogyan befolyásolható a hasi compartmen szindróma kialakulása? *Honvédorvos 2008, 59(3-4):135-142.*

6. **Fekete L.**, Bánfai K., Horváth L., Kiss P., Orgován Gy.: Malignus vékonybéldaganatokról szerzett tapasztalataink osztályunk ötéves beteganyagában. *Magyar Sebészet 2004, 57(4):209-213.*

7. Orgován Gy., Kovács G. Cs., **Fekete L.**, Bakity B., Záborszky Z., Tauzin F.: Szemléletváltozások a sebészi gyakorlatban az MH Központi Honvédkórház Általános Sebészeti Osztályán. *Honvédorvos 1999, 51(1-2):14-32.*

8. Orgován Gy., Kovács G. Cs., **Fekete L.**, Záborszky Z.: Has lövési sérüléseinek ellátási taktikája. *Honvédorvos 1997, 49(3):145-154.*

DOI azonosító: 10.17625/NKE.2015.008

9. Bakity B., Kovács G. Cs., Orgován Gy., **Fekete L.**, Záborszky Z.: Changes in colorectal surgery at our department during a 10 year period. *Br. J. Surg., 1998, 85(2. suppl.)*

10. Orgován Gy., **Fekete L.**, Kovács G. Cs., Bakity B., Záborszky Z.: Our experiences obtained in the course of performing laparoscopic cholecystectomy (LC) in acute cholecystitis. *Br. J. Surg., 1998, 85(2. suppl.):118*

11. Orgován Gy., Tauzin F., **Fekete L.**, Kovács G. Cs., Kiss P.: Szövődmények, valamint az UH-os utánkövetés eredményességének retrospektív vizsgálata 650 Laparoscopos cholecystectomia kapcsán (L.C.). *Magyar Sebészet 1996, 49(6):173.*

12. Orgován Gy., **Fekete L.**, Tauzin F., Bakity B., Szentesi M., Kovács G. Cs.: Laparoscopos cholecystectomia 350 eset kapcsán. *Honvédorvos 1994,46(3):145-151.*

13. Orgován Gy., Tauzin F., **Fekete L.**, Bakity B., Szentesi M., Kiss P.: A Laparoscopos cholecystectomia határai 200 eset kapcsán. *Magyar Sebészet 1994, 47(6):40.*

14. Orgován Gy., **Fekete L.**: Beszámoló a laparoscopos colon-, vékonybél, rectumsebészeti kurzusról. *Honvédorvos 1994, 46(1):58-59.*

DOI azonosító: 10.17625/NKE.2015.008

10. THE DOCTORAL STUDENT'S PROFESSIONAL SCIENTIFIC CV

Personal data

Name:	László FEKETE MD
Place of birth:	Eger
Time of birth:	March 14 1963.
Work address:	Magyar Honvédség Egészségügyi Központ I.Sebészeti Osztály, Általános Sebészeti Részleg 1134 Budapest, Róbert Károly krt. 44.
Address:	2120 Dunakeszi, Nándorfehérvár u. 26.
Telephon number:	+36 20/9324-172

Qualifications

1988 General Medical Diploma, Semmelweis Medical University
Faculty of General Madicine
1995 Specialist examination in surgery
1999 Specialist examination in military medicine and disaster medicine

Languages

1998 English Pitman Intermediate exam
(registrated as "C" type State Language Exam in 1998)
Russian - basic level

Position

1988-1991 unit service *(Brigade Medical Service Chief, Jászberény)*
1992-2009 surgeon associate professor
since 2009 Deputy Chief of Department

Membership

Hungarian Chamnber of Madicine
Hungarian Surgeon Society
Hungarian Gastroenterologic Society
Society of Hungarian Disaster Medicine
Society of Hungarian Oncologists
Europian Pancreas Club

DOI azonosító: 10.17625/NKE.2015.008

Competitions

1986 The diagnosis, the modern treatment and rehabilitation of acute pancreatitis (A first price winning paper for a competition signed by the Rector)

Courses, further training

1993 Basic Laparoscopy course, SOTE I. Surgical Clinic, Budapest
1993 Laparoscopic intestine surgery course, Cincinnati, U.S.A.
1995 Laparoscopic hepato-biliaris and pancreas surgery course, Strasbourg, Franciaorszá
1996 Laparoscopic intracorporalis course on stiching technoques, POTE Clinic for Experimental Surgery
1995 General course in Laser technology, Budapest
1993 American-Hungarian Military Doctors' Conference, Balatonkenese
1996 American-Hungarian Military Doctors' Conference, Landstuhl, Germany
1998 American-Hungarian Military Doctors' Conference, Chiemsee, Germany
2000 Treatment of War Casualties on the Battlefield PFP course, Hilversum, The Netherlands
2000 American-Hungarian Military Doctors' Conference, Passau, Németország
2003 American-Hungarian Military Doctors' Conference, Budapest

Scientific work

Number of publications: 33
Posters, lectures: 80

In 2012 as an individual student I applied for the Military Technical Doctorate School of the University of National Defence. During my 2-year research period I worked out a method for detecting the electric activity of the abdominal gastro-intestinal tract. My PhD thesis the title of which is *Electro-gastro-intestinography (EGIG): a new non-invasive method for monitoring abdominal functions in operational areas* summarises the result of my research.

Budapest, 09. 10. 2014.

Lt Col László FEKETE, MD