

Incidence of amputations among patients with diabetes mellitus in the Czech Republic from 2010 to 2014

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Summary

Introduction: Information about the incidence of organ-affecting complications of diabetes, including the diabetic foot syndrome, can be obtained from the documents of the Institute of Health Information in the Czech Republic. **Goal:** Assessment of the development of high amputations and minor surgical procedures on the lower limb from 2010 to 2014 in a representative sample of the population of patients with DM kept in the General Health Insurance Company of the Czech Republic database. **Methodology:** We identified all individuals in the VZP database who had a record of DM diagnosis (E10 – E16 based on ICD 10) or any antidiabetic therapy prescribed (ATC group A10) in the period of 2010 – 2014. A set of patients who had an agent from A10 group prescribed at least once in the given year was extracted for analysis. In the next step we identified individuals, who in the period of 2010 – 2014 also underwent a surgical procedure on the lower limb due to diabetic foot. **Results:** An absolute number of lower limb amputations remains at a stationary level. **Conclusion:** The submitted analysis presents the first assessment of the development of surgical treatment of diabetic foot in the Czech Republic. The amount of surgical procedures on the diabetic foot remains stable, regarding both high amputations and lower limb minor surgical procedures. In the context of an absolute increase of patients treated for diabetes mellitus, the stationary state is an indication of a relative decrease, which is favourable in particular with regard to the amputation of long bones.

Key words: diabetes mellitus – diabetic foot syndrome – amputation

The only relevant public source in the Czech Republic which displays information about the occurrence of chronic complications in patients with diabetes mellitus (DM), is the statistics of the Institute of Health Information and Statistics (ÚZIS) [1]. Nonetheless the data from ÚZIS provides information on the prevalence of different complications, but it has no data on the incidence.

The diabetic foot syndrome is a very serious complication of DM, whose pathogenesis is related to a combination of reduced peripheral sensation due to a diabetic neuropathy, tissue ischemia due to peripheral arterial injury, and infection is a frequent factor in stagnant or worsening ulceration. The treatment involves a combination of revascularization (if needed), antibiotic treatment, relief and a patient local care. The beginning of ulceration is a critical moment when an on-time and sufficiently active curative intervention can still heal the ulceration, but if the treatment starts late or it is not adequately aggressive, the extremity may be threatened. Quite frequently the treatment also

includes minor surgical procedures on the foot including an amputation of part of a toe or ray that remove an infected tissue and lead to the saving of the extremity. High amputations (amputation of a long bone), by contrast, are a signal of an extensive injury and impossibility of saving the extremity.

The aim of the study

The aim of our retrospective epidemiological analysis was to evaluate the development of incidence of high amputations and lower limb minor surgical procedures in the period of 2010–2014 in a representative sample of the Czech population of patients with diabetes mellitus registered in the General Health Insurance Company of the Czech Republic (VZP) which provided health care coverage for 63% of Czech population in 2014.

Methodology:

We identified all individuals in the VZP database, who in the period of 2010 – 2014 had a record of DM diagnosis (E10 – E16 based on MKN 10) [2], or who had any

antidiabetic therapy prescribed (ATC group A10) [3]. Subsequently a set of patients was extracted for analysis, who had any agent from the group A10 prescribed at least once in the given year, i.e. they were surely patients with DM. All the data concerning patients is identified in the original database for one person by a personal identification number. The data provided by VZP and used for analysis was blinded by conversion on an anonymous identifier which however enables tracing of all prescriptions and medical practices relating to a particular person.

In the next step we identified individuals who in the period of 2010 – 2014 also underwent a surgical procedure on the lower limb due to diabetic foot, i.e. they suffered from more serious forms of the syndrome.

Results

The ÚZIS Report on the activities of diabetology for the year 2013 specifies the prevalence of patients with the diabetic foot syndrome and performed amputations. In 2011 the method of reporting amputations was changed, the summary number gives the sum of amputations below and above the ankle, which led to a seeming increase of amputations compared to the year 2010. According to the ÚZIS data the prevalence of the diabetic foot syndrome is stationary, with

a moderate increase in an absolute number of patients with an amputation, however without distinguishing between the above- and the below-the-ankle amputations. The data is presented in Table 1.

Chart 1 shows the development of lower limb surgical treatment in patients with antidiabetic treatment record. A moderate decrease in high amputations and lower limb minor surgical procedures is evident between 2011 and 2012 as compared to 2010, followed by a moderate increase back to the level of the year 2010 in 2013. If we compare this number with the significant total increase in patients with an antidiabetic treatment record, it is clear that the number of lower limb amputations in percents is on the decrease.

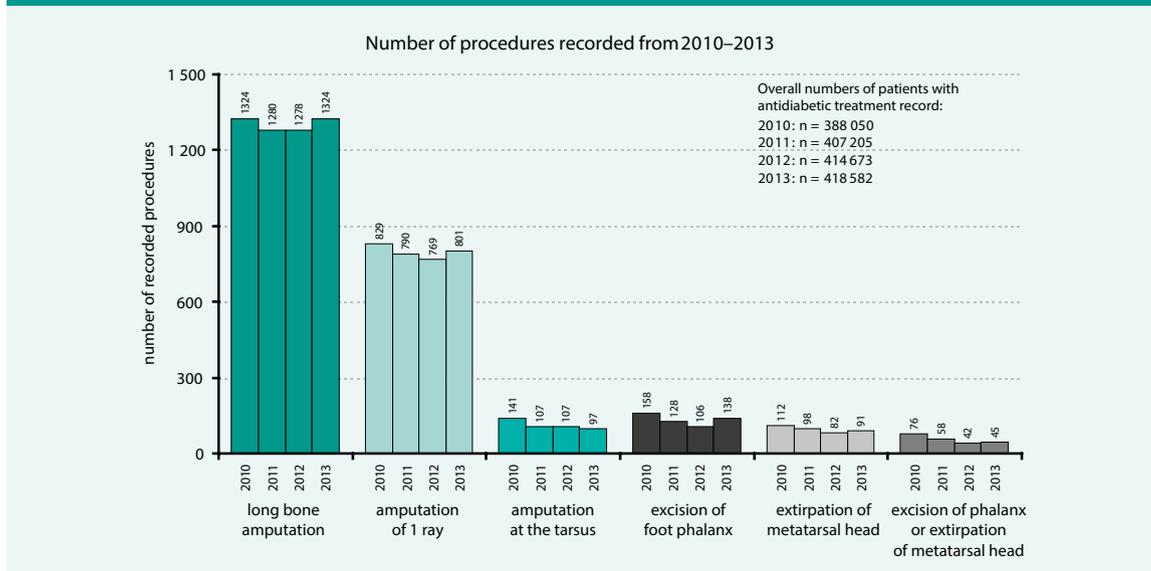
It is also possible to establish from the VZP data the shares and numbers of individual procedures as per the regions of the Czech Republic. The greatest number of procedures was carried out in Prague and the South Moravian region, which is definitely related to the concentration of more serious patients in large centres (in Prague there are 5 podiatric clinics cooperating with surgical clinics, Brno has 2 such clinics). The greatest share of amputations in absolute numbers is recorded in Ústí nad Labem region, where only one podiatric outpatient clinic operates for the whole region. It can be inferred that a surgery is the only way of treatment

Table 1 Prevalence of diabetic foot syndrome based on ÚZIS database from 2010–2013

	2010	2011	2012	2013
Diabetic foot syndrome total	45 118	44 011	43 248	44 657
Diabetic foot syndrome with amputation	8 501	10 408*	10 425*	11 168*

* The method of reporting amputations was changed in 2011, the given numbers summarize the amputations below and above the ankle.

Chart 1. Diabetic foot surgical procedures in patients with an antidiabetic treatment record – VZP data from 2010–2013



in many cases, which takes the place of a comprehensive podiatric care (Chart 2).

At the opposite end, a very small to zero number of mainly lower limb surgical procedures in Karlovy Vary region likely indicates transfer of patients to other centres.

Discussion

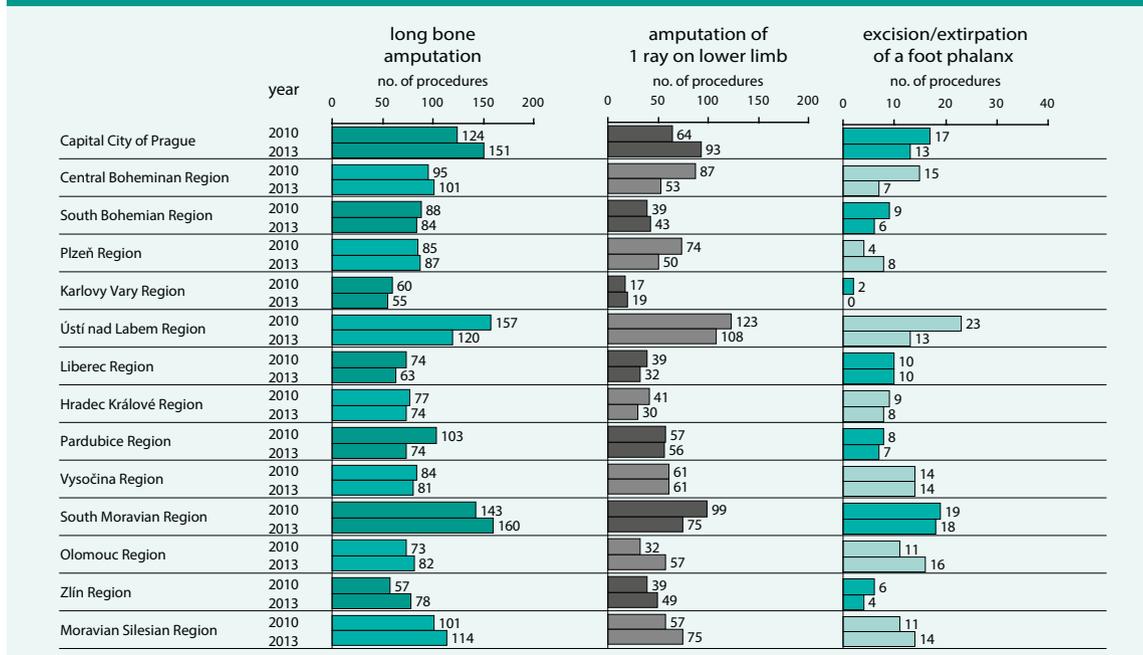
According to the present recommendations it is necessary to always treat patients with the diabetic foot syndrome comprehensively, while omission of any part of the treatment results in slowing the healing process or worsening of ulceration and unnecessary amputation. In particular two essential elements of the comprehensive therapy must be mentioned which are the most frequently omitted in practice: diminishing the pressure on ulceration and efficient, long-term antibiotic treatment of sufficient length. Suspicion of vascular etiology should always indicate relevant examinations including angiography and in the case of ischemia revascularization must be attempted [4,5]. As to patients with a more serious injury, especially the combination of ischemia and infection, we cannot avoid minor surgical procedures on the lower limb, such as amputation of a phalanx, the metatarsal ray, extirpation of a metatarsal head (primarily as the cause of recurrent neuropathic ulcerations in the metatarsophalangeal area) or an amputation at the tarsus. These procedures lead to preserving the limb function and many times several are performed on one patient within a few weeks. As opposed to that, a high amputation is a serious decision

since removing a part of the limb significantly reduces life quality and imposes limitation on the patient’s mobility. From the surgeon’s point of view, however, it is many times a simple and „less expensive“ one-off solution, whereby both the patient and the physician avoid a long-term antibiotic treatment and repeated minor lower limb procedures. But the only case of a justified high amputation is an infection in the leg so serious that it endangers the patient’s life. Therefore a large number of high amputations may paradoxically indicate a risk of poor care as a result of which the patient, instead of getting a comprehensive podiatric care, is subjected right to an amputation surgery.

Late complications of diabetes including the diabetic foot syndrome mark the length of duration of diabetes rather than current metabolic compensation, as with a higher life expectancy patients live longer with their disease and the risk of organ complications therefore increases. Still according to available analyses the number of patients treated appropriately, in accordance with recommendations, is on the increase [6]. The stable amount of lower limb surgical procedures thus appears to be a good result.

The VZP data analysis also suggests the level of comprehensive podiatric care in different regions. The care of a great number of patients is concentrated in the South Moravian and Praha regions, including many from the neighbouring regions, whereas a large proportion of high amputations in Ústí nad Labem region might point to insufficient podiatric care.

Chart 2. VZP data on the number of diabetic foot procedures in patients with a record of antidiabetic treatment from 2010-2013 based on the region of the treatment (the region where the most routine procedures are recorded for a given person – ambulatory checkups and antidiabetic medicine prescriptions)



The presented data is close to the results published in other countries. But their comparison is difficult, mainly due to different methods used. We see the benefit of our analysis in its covering a large part of the whole Czech population with diabetes mellitus, unlike local studies in which selected physicians are engaged and the studies therefore do not offer a coherent view of the level of care as a whole in the given country.

Between the years 1990 and 2010 the amount of organ complications of diabetes, including myocardial infarction, stroke, amputations and end-stage renal diseases significantly decreased in the USA. We can see that the total number of amputations (both minor and high) has increased, but their percent proportion per number of patients treated for diabetes has declined to roughly one half. The number of amputations on patients without diabetes remained at the same level. The authors attribute this decline to the improvement of the preventive care for diabetic patients, whose absolute number has tripled over the period concerned [7]. The reduction in the incidence of complications is linked by another analysis to the average improvement in metabolic compensation, decrease in blood pressure and LDL-cholesterol values in the population of diabetic patients, although only 14.3 % of diabetics reached the target values in all three parameters [8].

The Eurodiale study conducted for the European population followed 1 088 patients with newly developed diabetic foot ulceration. Patients received standard therapy and were monitored until healing, dying or performance of high amputation, however for a one-year period at the most. Within the one-year period 4.6 % of the patients underwent above-the-ankle amputation, among them predominantly the patients who had reported reduced life quality already before the study was commenced [9].

Conclusion

The submitted analysis presents the first assessment of the development of surgical treatment of diabetic foot in the Czech Republic. The amount of surgical procedures on diabetic foot remains stable with regard to both high amputations and lower limb minor surgical procedures. In the context of an absolute increase

of patients treated for diabetes mellitus the stationary state is an indication of a relative decrease, which is favourable in particular with regard to amputation of long bones.

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