CONCLUSION

Diabetes in the elderly: considerations for clinical practice

P Lecomte

The elderly diabetic, between successful aging and frailty [1]

The elderly diabetic patient wants to retain independence for activities of daily life as long as possible. Frailty is an intermediary state between successful aging with completely autonomous function and irreversible dependency (pathological aging). Each of these situations requires an appropriate adaptation of therapeutic goals and practices. For diabetics, the constraints of treatment and the risk of complications constitute a supplementary burden hindering successful aging.

How can frailty be assessed? Once the diagnosis has been established, does good glucose control have an impact on the course of the subject’s frailty or disability?

Clinical signs of frailty include: dementia, depression, loss of muscle force and malnutrition. Among the biological signs, hyperosmolarity appears to be the most well documented, together with C-reactive protein (CRP) and interleukin-6 (IL-6).

Use of a standardized geriatric evaluation scale (GES) has demonstrated efficacy for the prevention of loss of autonomy and improvement of quality-of-life in frail persons but does not appear to have an effect on mortality. Standardized geriatric evaluation should be performed by diabetes specialists working with elderly subjects to better define the therapeutic goals and management practices (see Table I in reference 1). The GES includes items to assess the subject’s comprehension, mood, stability and risk of falls, functional autonomy and pain, food intake, urinary incontinence, critical lecture of medications and morbidity factors, knowledge of social support, and self-evaluation of quality-of-life and perception of health. This enables an attempt to correct accessible factors (depression or osteoporosis for example) to prevent or limit progression from frailty to irreversible dependency.

Diabetes is a chronic disease which appears to be one of the most powerful factors limiting potential for successful aging. It is currently recommended to search for clinical signs of frailty among elderly diabetics. Logically, prevention of factors hampering the process of successful aging could decrease the effect of diabetes on such progression, glucose control of course playing an important role. It would be useful to study the effects of individualized care for the diabetic subject, as well as with the impact of implementing the GES, on the aging pattern in diabetics. This type of study has never been undertaken and could be an objective for a joint study conducted by the SFGG (French Society of Geriatrics and Gerontology) and the ALFEDIAM.

Epidemiology [2]

A representative sample of diabetic persons living in France (ENTRED, Echantillon National Témoin Représentatif des personnes Diabétiques) [3] was recently surveyed demonstrated that more than 500,000 French people aged over 75 years and more than one million aged over 65 years have diabetes. Twenty-five percent of the diabetic population in France is aged over 75 years. According to the World Health Organization (WHO), this prevalence will further increase in Europe because of improved screening, longer follow-up (including among diabetics), and increased incidence. The prevalence of diabetes is thus higher in institutionalized persons (14.8% in the institutionalized population aged over 60 years in the French study) who more frequently present loss of autonomy and cognitive decline. The incidence increases with age and is greater among men than women (5.9/1,000 person-years in men versus 2.4 in women). Search for diabetes must not be neglected in the elderly population: in ENTRED, 23% of subjects aged over 85 years had a recent diagnosis of diabetes (< 5 years). In the oldest age groups, mortality, particularly from cardiovascular causes (coronary heart disease and stroke) was higher in diabetics than non-diabetics (40 and 80% higher in the 75-84 yr age group, with a more marked difference in women). Life expectancy is 3 to 6 years shorter in diabetics aged over 65 years. Management of diabetes is insufficient: HbA1c ≥ 8% in more than one...
quarter of the population and blood pressure > 140/80 mmHg in more than 50% in the 65-71 yr age group and 71% in the > 85 yr age group. According to the ENTRED survey, sulfamides are generally prescribed (64%) after the age of 65 years, insulin being prescribed for 17% of patients in the 65-74 yr age group and for 24% in the > 85 yr age group. Quality-of-life is altered and cardiovascular function insufficiently taken into consideration: insufficient prescription of antihypertensive and lipid lowering therapy [4, 5]. Similarly, surveillance is insufficient (HbA1c assay once a year in a third of patients, absence of blood pressure measurement during an 18 month period in 47%). Nutritional status is often neglected, particularly among nursing home residents. In this French study, approximately 25% of diabetic subjects were not given specific dietary counseling and carbohydrate intake was less than 180 g in 28%. More attention should be given to diabetes in the elderly population. Studies on the management of diabetes in the institutionalized population would be useful.

Glycaemic goal

Maintaining HbA1c as close to 7% as possible is probably the best way to prevent complications, but there is no specific proof in the elderly population. This rule must therefore be applied with prudence taking into consideration the individual clinical context. The gravity of a new pathological condition, the loss of autonomy, and the nutritional status of the patient are better prognostic factors than age per se [1]. The duration of the diabetic disease and co-morbid conditions influence the goal set for glycaemic control. In could be “better* to control blood pressure or lipid parameters in this population than to normalize blood glucose whose beneficial effect takes time. Appropriate nutritional counseling is needed to ensure sufficient protein and calcium intake and maintain body weight. Any acute condition can provoke stress-related hyperglycaemia with a risk of hyperosmolarity and insulin resistance.

Hyperosmolarity is an acute complication almost exclusively observed in the elderly population [6]. There is some debate concerning the definition: plasma osmolarity > 320 mOsm/l for some and blood glucose > 6 g/l or 8 g/l, or even 3 g/l, for others. Dehydration and impaired consciousness (even without overt coma) are constant features, generally related to an underlying infection. Medications (diuretics and corticosteroids) also have an impact, as well as patient independence (for food and fluid intake, which can be complicated by swallowing disorders or incontinence hindering intake). Major hyperglycaemia is a cause of dehydration due to less sensitivity to thirst sensation in this population and reduced ADH secretion in the event of Alzheimer’s disease. Kidney function plays an essential role. The fall in cortisol binding globulin (CBG) secondary to increased IL-6 secretion, leads to a massive rise in free cortisol aggravating hyperglycaemia. The association with catecholamine hypersecretion increases insulin resistance related to the infectious state; the pancreas cannot adapt or malnutrition prevents physiological adaptation. Prognosis is poor, even with intensive care. Hospital mortality reaches 35%. Functional dependency is the most important predictive factor. One-year mortality is 69%. Factors predictive of death are functional dependency and pressure sores. Metabolic disorders can usually be controlled easily, but overall management, including care for cognitive disorders, malnutrition, infection, loss of autonomy, and pressure sores is extremely difficult, because hyperosmolarity is a complication of frailty.

Setting glycaemic goals, especially at this age, requires consideration of the patient’s functional autonomy (what CAN the patient WANT to do?) and decisional autonomy (what does the patient WANT to do?). In the elderly population, the definition of the appropriate glycaemic goal is based on expert consensus. A prudent attitude must be taken. Increasingly, the approach is to define the goal in terms of the patient’s autonomy or frailty, keeping in mind that the elderly subject has a higher risk of complications of hyperglycaemia: falls and injury, cognitive decline, depression, degraded quality-of-life [7]. In the future, proof of improved survival in a cohort of diabetic patients with HbA1c levels close to the target 7% in comparison with less well controlled counterparts is a major objective with a supplementary study of quality-of-life in autonomous elderly subjects.

Hypoglycaemia in the elderly subject [8]

Hypoglycaemia is inevitable in well-controlled diabetes, but in the elderly subject can have serious, sometimes life-threatening, consequences for the heart or brain, both in terms of morbidity and quality-of-life. In these elderly patients, the risk of hypoglycaemia must be balanced against the potential benefit of normalized glycaemia. Symptoms are somewhat different than those observed in younger subjects (especially blurred vision and instability) and often blunted by an autonomous neuropathy or impaired cognitive function (“silent” hypoglycaemia). They can lead to injury or falls with fracture, all factors which have a disruptive effect on the frail subject. Two recent studies [9, 10] challenge the idea of the gravity, finding that mortality is zero or very low (4%) in the event of severe hypoglycaemia in elderly subjects, aged 76 years on average in one study and 66-89 years in the other. Hypoglycaemia is observed at the end of the morning and in the afternoon in insulin treated patients. It is well known that hypoglycaemia episodes in patients taking sulfonylurea are longer than in insulin-treated patients. Favoring factors other than age are multiple co-morbid conditions (psychiatric conditions and depression leading to variable food intake), renal impairment (sulfonylureas multiply the risk of severe hypoglycaemia by nine, especially if food intake is irregular), multiple medications (high-risk association with antibacterial sulfamides), and more frequent poorly adapted behavior response. To this list should be added the rare use of self-monitoring and the absence of patient and caregiver education regarding the symptoms of hypoglycaemia. Renal
impairment being frequent, renal function should be monitored regularly with creatinine clearance (decreased muscle mass). The direct cause of hypoglycaemia is generally related to a dietary error (53% of hypoglycaemic episodes follow a skipped meal) and/or recent hospitalization (change in therapy poorly adapted to home life).

The frequency of severe hypoglycaemia remains moderate among patients with type 2 diabetes (0.4 episode per 100 patient-years), irrespective of treatment, compared with insulin-treated patients (1.5 episode per 100 patient-years). Hypoglycaemia is three times more frequent when insulin is used alone compared with antidiabetic drugs, combined treatments exposing the patient to an intermediary risk. In the Diabetes Outcomes in Veterans Study (DOVS), the number of insulin injections and the use of rapid insulin increased the risk of hypoglycaemia. Rapid analogs require further evaluation, but could reduce the risk of hypoglycaemia. Injection just before meals, or even during meals, is a good way of adapting dose to real food intake. But in practice multiple injections are not always easy to implement in the elderly subject.

For antidiabetic drugs, α-glucosidases do not cause hypoglycaemia, and metformin almost never. The pharmacokinetic properties of sulfamides would favor use of second generation short-acting drugs. The risk of severe hypoglycaemia is lower with glipizide and tolbutamide than with glibenclamide or chlorpropamide and hypoglycaemia is four times more frequent with glibenclamide than with glipizide. Prolonged-release glipizide is associated with severe hypoglycaemia in elderly subjects and/or in subjects with renal impairment. The short half-life and biliary elimination of glinides are interesting properties, but like glitazones, specific large-scale studies in elderly persons are lacking. There was one study of a subgroup of diabetics aged over 65 years which showed that the benefit and secondary effects of pioglitazone were the same as observed in subjects aged less than 65 years.

In the future, it would be useful to evaluate the effects of rapid insulin analogs and glinides on the hypoglycaemic risk in an elderly population aged over 70 years.

**High blood pressure in the elderly subject [4]**

In the elderly diabetic, systolic-diastolic hypertension related to a metabolic syndrome or diabetic nephropathy, is frequently associated with isolated systolic hypertension related to arterial rigidity.

The beneficial effect of treating hypertension in the elderly subject (> 60 years) has been demonstrated for coronary mortality, stroke, and all-causes death. In very elderly subjects, the benefit is less pronounced with a greater iatrogenic risk. In a meta-analysis devoted to patients aged over 80 years [11], the risk of stroke was reduced 34%, the risk of major cardiovascular events 22%, and the risk of heart failure 39%, with no benefit in terms of cardiovascular mortality. What are the results for elderly diabetics? Randomized studies versus placebo have provided the following information.

SHEP with chlortalidone conducted in diabetics aged > 60 years demonstrated a greater decline in the risk of coronary events and major cardiovascular events without any decrease in overall mortality, a result confirmed with 15 years follow-up.

In the SYST-Eur study conducted with nitrendipine in subjects aged more than 60 years with isolated systolic hypertension, there was a greater decrease in stroke and major cardiovascular events in diabetics, with sustained results four years later.

The SCOPE study of patients aged 70-89 years (12% diabetics) treated with candesartan in addition to other antihypertension treatments, showed no significant decrease in major cardiovascular events, myocardial infarction, or cardiovascular or stroke mortality, but there was no analysis of a diabetic subgroup.

The HOPE study with ramipril was conducted for 4.5 years and also demonstrated a lower risk for major cardiovascular events, which was 25% greater in diabetics, especially in those aged over 65 years.

Overall, the elderly diabetic patient benefits from treatment of hypertension; the benefit is equivalent to, if not greater, that observed in the non-diabetic.

**What blood pressure goals should be set for elderly diabetics?**

In the HOT study with felodipine (subjects aged 50-80 years, 8% diabetics), the risk of major cardiovascular events was lowered 51% and the risk of stroke 30% in the group of patients whose diastolic pressure goal was ≤ 80 mmHg, but with a greater risk of major cardiovascular events and more specifically coronary death for goals < 75 mmHg.

In ongoing VALISH study sets optimal systolic pressure at ≤ 140 or ≤ 150 mmHg in subjects aged 70-85 years.

**What treatment should be used in general and in specific situations?**

The ALLHAT study compared a thiazidine (chlortalidone), a calcium channel blocker (amlodipine) and a converting enzyme inhibitor (lisinopril). For patients aged > 65 years, the thiazidine was found to be superior to the converting enzyme inhibitor as regards risk of coronary heart disease, cardiovascular disease, and heart failure, and superior to the calcium channel blocker as regards risk of heart failure. The same observations were made in diabetics, with however equivalence for lisinopril and chlortalidone as regards coronary risk.

In the LIFE study, losartan was compared with atenolol in patients with hypertension and left ventricular hypertrophy aged 67 years on average. In the diabetic group, losartan was found to be superior to atenolol in terms of cardiovascular morbidity and mortality and cardiovascular death.
In selected patients with coronary heart disease, a converting enzyme inhibitor, perindopril, was more effective than placebo (EUROPA study) for the prevention of major cardiac events and nonfatal myocardial infarction in patients aged over 65. The INVEST study compared a calcium channel blocker (prolonged-release verapamil) with atenolol. Overall mortality, major cardiovascular events, myocardial infarction, and stroke were not different. The subgroup of diabetics aged over 70 years appeared to respond better to the calcium channel blocker.

Perindopril (converting enzyme inhibitor) was significantly more effective than placebo for secondary prevention of hemorrhagic and ischemic stroke (PROGRESS study).

Microalbuminuria can be prevented with converting enzyme inhibitors or sartans, but specific data are lacking in the elderly subject.

In clinical practice, the blood pressure goal for the successfully aging diabetic remains the same, irrespective of age, < 130/80 mmHg. Search for orthostatic hypotension is required, particularly in subjects aged > 60 years taking a regimen combining two or more drugs (55% of patients). Blood pressure self-monitoring using a validated device (AFSSAPS) is recommended because the “white coat” syndrome can concern up to 25% of elderly subjects with hypertension (particularly women). Furthermore, self-monitoring enables the diagnosis of masked hypertension. It would be prudent to avoid lowering diastolic pressure below 75 mmHg (coronary risk, HOT study) and to avoid lowering systolic pressure more than 20-30 mgHg if the systolic pressure is > 180 mmHg. The risk of low brain perfusion is not negligible and tolerance should be carefully monitored.

Despite interest in thiazidine diuretics, particularly for the prevention of heart failure, because of the risk of hypokaliemia induced by calcium channel blockers, converting enzyme inhibitors or sartans are often preferred for first-intention treatment. This is a marginal debate because of the frequency of combination regimens. Beta-blockers, often associated with diuretics, should still be used for the coronary patient even though the LIFE study demonstrated a slight advantage with losartan over atenolol. These drugs increase the risk of heart failure. Calcium channel blockers are often used for first-intention treatment of the elderly diabetic despite the risk of edema and orthostatic hypotension. Their efficacy in reducing the risk of stroke is well established but the risk of heart failure appears to be greater than with diuretics and the risk of myocardial infarction could be slightly higher compared with diuretics or converting enzyme inhibitors.

The efficacy of converting enzyme inhibitors is well demonstrated, as is their preventive effect, in subjects with high vascular risk. Their effect is less pronounced than diuretics for risk of heart failure, stroke and coronary heart disease in elderly diabetics, but the nephroprotective effect is preserved. Cough is often a limiting undesirable effect. The risk of renal impairment or hyperkaliemia in the event of renal stenosis in certain patients is recognized and warrants surveillance. The converting enzyme inhibitor class is widely used for first-intention treatment of elderly subjects, particularly those with systole-diastolic hypertension because of the low risk of hypotension and the neutral metabolism. Sartans have demonstrated efficacy, particularly a nephroprotective effect. Data on this class are lacking in the elderly diabetic population. Their superiority for reducing risk of major cardiovascular events has not been demonstrated (VALUE study).

Serum creatinine and potassium should be obtained one or two weeks after starting a converting enzyme inhibitor or sartan or after increasing dose, then regularly every year. Electrolytes should be obtained one to two weeks after introducing a thiazidic or loop diuretic, then at least once a year. It is also important to carefully monitor elderly patients who have a co-prescription with a potential nephrotoxic effect (NSAID).

Further studies are needed to answer two specific questions: up to what age is treatment indicated? and what should be the attitude for frail patients? For the first question, the importance of preventing stroke, which in the elderly population causes major disability, suggests treatment would be beneficial at all ages, even though it may not have effect on mortality. Tolerance to antihypertensive treatment in the elderly population also requires further study. The methodology required to answer the second question is quite problematic, but at the present time blood pressure goals of < 150/90 mmHg can be recommended.

**Dyslipidemia in the elderly subject [5]**

Diabetes causes overmortality and increased cardiovascular morbidity-mortality, even in elderly subjects and those with dyslipidemia. In subjects aged over 65 years, hypercholesterolemia remains a vascular risk factor, but after adjustment for other risk factors, the positive correlation between cardiovascular mortality and total cholesterol is less and less pronounced with increasing age. In the over 80 years group, serum HDL-cholesterol (HDL-C) below 0.35 g/l remains a risk factor for cardiovascular death, recalling that HDL-C declines with decreasing activity level. The efficacy of statins to correct lipid parameters and prevent cardiovascular morbidity-mortality remains unchanged with age.

The questions are: should dyslipidemia be treated after the age of 75 years? And if so, what treatment is best adapted to the elderly population with frail muscles and liver.

Three recent studies have detailed the potential benefit of such treatment in elderly subjects (PROSPER study) and in diabetics (HPS and CARDS) among subgroups of older subjects.

The PROSPER study was the only one specifically conducted in high-risk elderly subjects aged 70-82 years free of cognitive deficit treated for secondary or primary prevention. Pravastatin 40 mg for three years reduced the risk of nonfa-
tal myocardial infarction or coronary death 15% but had no significant effect on stroke. Adverse effects were not more frequent with pravastatin. Subjects with low HDL-C benefitted most from treatment. A 25% increase in the risk of cancer in the pravastatin group is noteworthy.

The HPS study concerned subjects aged 40-80 years with a history of stroke, lower limb arteritis or diabetes given simvastatin 40 mg for primary or secondary prevention. The efficacy of simvastatin was the same irrespective of the age groups: 25% reduction in the risk of a first stroke, the same reduction being observed in diabetics over 70 years. In diabetics aged 65-80 years, simvastatin enabled a reduction in the risk of major cardiovascular events by 31%. Adverse effects were less frequent: 0.47% for elevated transaminases and 0.13% for elevated CPK.

CARDS was a study conducted in diabetic patients aged 40-75 years free of vascular disease whose LDL-C level was ≤ 1.6 g/l and who had had at least one complication. Atorvastatin 10 mg reduced the risk of a first cardiovascular event by 37% with no increase in the iatrogenic risk.

It can thus be proposed, at least for independent elderly subjects, that statins have proven efficacy. Compliance with treatment should be closely followed. There is no difference in tolerance with age. As is always true in the geriatric population, care must be taken to consider the patient’s complete clinical situation. No information is currently available concerning the usefulness of statins in diabetics aged over 80 years. Further research would be useful here despite the necessarily difficult methodology.

The brain of the elderly subject [7]

The impact of diabetes as an independent risk factor for the brain is obvious. There are three intercurrent aspects: cognitive decline and dementia, depression, and cerebral vascular events. This triad is an important handicap for the diabetic patients, deteriorating quality-of-life and generating considerable social and economic consequences.

Cognitive decline is more marked in diabetics, in relation with disease duration and glucose control. Declining intellectual performance compromises patient management, leading to frequent hospitalizations. Vascular dementia is a rapid deterioration of cognitive function occurring within three months following a cerebral vascular event (multiple infarcts or hemorrhagic accident). Diabetes increases the risk of vascular dementia 2- to 8-fold. The pathogenic association observed so often is diabetes plus hypertension. Hypercholesterolemia and systolic hypertension predispose to Alzheimer’s disease (particularly in diabetics with the Apo E4 gene). These data are debated. It would appear that diabetes per se does not increase the risk of Alzheimer’s disease. A simplified insulin regimen administered by a third person is the therapeutic solution in the event of cognitive disorders. Improved glycaemic control, avoiding hypoglycaemia, slows down the degradation of cognitive function. The preventive role of statin as regards Alzheimer’s disease is a subject of debate.

Depression, a syndrome particularly frequent in the elderly subject, not specifically the diabetic elderly subject, is sometimes confused with dementia or cognitive decline. History taking can be helpful: the fluctuating nature of memory disorders, concentration of complaints on memory disorders, presence of moral suffering, and predominantly depressive mood or guilt feeling. More systematic search for depression and better care is thus necessary in elderly diabetics.

Stroke is a frequent complication feared by elderly diabetic patients. The risk of ischemic stroke is globally increased three-fold in diabetics, but diabetes appears to protect against hemorrhagic events. Stroke creates a high risk of disability [1]. The predisposing factors are the same as in the young subject: hypertension, atrial fibrillation, carotid stenosis, and poorly controlled diabetes, or history of a cerebral vascular event. Stroke mortality appears to be higher in type 1 or type 2 diabetes, particularly in the acute phase. As for myocardial infarction, the glycaemic level during the acute phase is a prognostic factor. Undeniable progress has been made in primary prevention of stroke. Controlled blood pressure in the elderly diabetic is an essential element of prevention but care must be taken to avoid very deleterious orthostatic hypotension and to search for tight carotid stenosis (fall in brain perfusion). Use of statins, even at this age, appears to be beneficial (HPS or CARDS) with a 25% to 48% decrease in the incidence of stroke. Antiplatelets (aspirin) are frequently used to decrease the risk of ischemic stroke, but increase the risk of hemorrhagic accidents in non-diabetic subjects. Further studies of other compounds are necessary to determine the usefulness of these treatments for primary or secondary prevention in the elderly diabetic. Regarding this triple therapeutic association, there is currently no study providing evidence on which indications can be established. The benefit of surgery on symptomatic carotid stenosis is greater in diabetics. In the event of an acute accident, good glycaemic control should be obtained as rapidly as possible, using insulin whenever necessary.

The role of antiplatelets for primary and secondary prevention in elderly diabetics should be determined by appropriate trials.

Treatment of the elderly diabetic [12]

Pharmacokinetic or clinical data are rare in subjects aged over 70 years and therapeutic recommendations are imprecise.

Oral antidiabetics

Oral antidiabetics include older classes of drugs, sulfonylureas and biguanids. It should be recalled that the prolonged-release formulation of glipizide (osmotic tablet Ozidia®) is contraindicated in subjects aged over 65 because...
of the risk of hypoglycaemia. The pharmacokinetic properties of glibenclamide are not modified by the aging process. In practice, the biological half-life of this drug is greater in the elderly patient and the hypoglycaemic effect of the same dose of glibenclamide is twice that of glipizide after the age of 65 years. A comparison between glimepiride and glitazone in subjects aged over 65 demonstrated comparable efficacy, but with an advantage regarding hypoglycaemia for glitazone. The most frequent contraindication for sulfonylurea in the elderly diabetic is advanced-stage renal failure, with a non-consensual creatinine clearance level set at 30-50 ml/min. Products with a long elimination half-life (carbutamide, chlorpropamide) should be avoided (professional consensus).

For biguanids (metformin), there are few data in the elderly subject. Lactic acidosis is favored by renal failure and hypoxia. The risk of lactic acidosis thus limits the use of biguanids after 70 years. Biguanids should be discontinued in the event of an intercurrent co-morbid condition (dehydration, surgery, injection of iodine contrast agent).

Among the more recent compounds, the pharmacokinetic properties of α-glucosidase are not modified in the elderly subject. As for metformin, there is no risk of hypoglycaemia. The sometimes serious adverse effects in the elderly subject limit its use. Contraindications include: intestinal obstruction-like syndrome, inflammatory bowel disease, intestinal herniation, and severe renal failure, frequent situations in the geriatric population.

The pharmacokinetic parameters of repaglinide are not modified as long as creatinine clearance remains above 40 ml/min, for diabetic and non-diabetic elderly subjects. The risk of hypoglycaemia if calorie intake is insufficient limits use of this drug in the elderly, despite is rapid and short action time, especially since no data are available in subjects aged over 70 years. This treatment cannot be used in subjects aged over 75. Contraindications are advanced renal failure (creatinine clearance < 30 ml/min), liver disease and combination with gemfibrozil.

Glitazones are mainly eliminated via the kidney (about 65%), with no drug interaction. Two articles have been published concerning the efficacy and tolerance of pioglitazone and rosiglitazone (more than 400 subjects aged ≥ 70 years), but with methodology (post hoc analysis) open to criticism. These studies reported comparable efficacy in elderly persons with type 2 diabetes compared with younger subjects with type 2 diabetes, with a non-significant trend towards more adverse effects (edema, anemia and heart failure). Weight gain and edema, moderate anemia (by hemodilution) limit the use of these compounds in the elderly subject. Cardiac decompensation, particularly in patients with pre-existing moderate renal or respiratory impairment or taking NSAID or insulin, is a risk. Precautions for use include pre-existing anemia, renal failure with creatinine clearance less than 30 ml/min (limited information), and of course and especially, heart failure.

**Insulin therapy**

There are many situations where insulin can be used (impaired renal function, acute intercurrent co-morbidity, insufficient oral treatment), increasing the risk of hypoglycaemia. Insulin therapy helps improve the diabetic patient’s general and nutritional status and, indirectly, institution of more effective surveillance (nurse monitoring capillary glucose before each injection) helping maintain the patient’s autonomy. The classical schedules of two daily injections of intermediate duration insulin or a mixed insulin (30% rapid + 70% intermediary), one injection given in the morning or evening using an intermediate insulin, with or without continuation of the oral antidiabetic, or a single injection of a long-action insulin analog (glargine) in the morning, can also be proposed. There has been no comparative study in the elderly subject demonstrating the usefulness of the stability of action provided by insulin analogs in terms of lower risk of hypoglycaemia, particularly at night. Postprandial injection of biphasic aspart insulin premix (30/70) in 93 patients with type 2 diabetes aged 70 years did not demonstrate any difference in the postprandial glycaemia patterns, HbA1c, or number of hypoglycaemia episodes compared with a preprandial injection. The moment of injection must therefore be adapted to meal time in dependent or assisted subjects. The injection can be performed by the patient, a familial caregiver, or a nurse depending on several factors: lifestyle, autonomy, neuropsychic context (cognitive or praxia disorders), visual acuity. Pens can be used by independent patients. The InnoLet® system was tested in the elderly subject in a recent 12-week cross-over study in 79 diabetics aged 68 years with type 1 or type 2 disease treated with insulin who presented visual and/or motor disorders. It was observed that the need for assistance and cost were both lowered.

The therapeutic strategy must be adapted to the glycaemic goals [13] in the elderly diabetic. Three arguments are in favor of using insulin: favorable action of insulin in undernourished patients; contraindications or precautions for use of oral antidiabetics due to co-morbid conditions or multiple medication; certain individual medical and/or social conditions which are frequently encountered: cognitive impairment, familial or social isolation, poor observance, loss of autonomy. These conditions require the organization of a care network to enable daily surveillance by a nurse. It can be recalled that a specific diary for the elderly diabetic on insulin integrates these specific notions.

For the future, much work remains to be done concerning use of long-acting insulin analogs, glitazones and glinides, in the elderly diabetic.

**References**