The disappearance of the second sound at the left of the apex, which, with the short sharp character of the first sound, marks the second stage of mitral stenosis, is probably explained by the following considerations. In the normal heart, a second sound is always audible at and to the left of the apex; and repeated careful examinations have convinced me that it is the aortic second sound which is here heard, and not the pulmonary, even when accentuated and unduly loud. In mitral stenosis, there are two influences tending to prevent the aortic second sound from reaching the surface of the chest. First, the left ventricle, not undergoing dilatation and hypertrophy, while the right enlarges greatly, is overlapped by the latter, which usurps the position of the apex, and thus the left ventricle cannot conduct the aortic sound to the chest-wall. Again, the aortic second sound will be weak, because the diminished amount of blood entering the ventricle, in consequence of the narrowed mitral orifice, will not distend the aorta, and will, therefore, fail to provoke a powerful recoil, such as is necessary for the production of a loud second sound.

The presystolic murmur itself often undergoes a modification in this stage. As commonly heard, it occupies the end of the diastolic interval, running up to the first sound, and corresponding therefore with the auricular systole. But it may be a long or a short murmur, and may indeed occupy the entire diastolic interval, when it will correspond not only with the auricular systolic but also with the active diastolic rebound of the ventricle from contraction; i.e., murmur is produced by the current of blood sucked into the ventricle as it dilates, as well as by that driven into it by the systole of the auricle. This murmur occupying the whole of the diastolic interval is most frequent in bad cases. But it may further be cut in two, and, instead of being a continuous rumble from the second sound up to the first, may subside as the active dilatation of the ventricle ends, and before the auricular systole begins; or the presystolic part proper of the murmur may be lost while the diastolic part remains audible, so that the only murmur heard is diastolic, i.e., a diastolic mitral murmur strictly speaking.

The third stage is characterised by the disappearance of the presystolic murmur, so that, the second sound being already lost, the only sound heard at and outside the apex is the short sharp first sound described. This is almost invariably coincident with the establishment of tricuspid regurgitation, and it is easily understood that when the tricuspid valve has given way the pressure in the pulmonary vessels will be diminished, and it is so very frequently to a degree which lowers the pressure in the left auricle to a point at which it is incapable of generating force sufficient to give rise to a murmur. It is not necessarily the case that serious symptoms are present when the third stage, as marked by the absence of the presystolic murmur, is reached; but it very frequently happens that, on the occurrence of any complication, the second stage passes into the third, and that on improvement taking place this is reversed.

But, besides the occurrence of tricuspid regurgitation from over-dilatation and dilatation of the ventricle, there is a considerable liability to actual disease of the tricuspid valves, and to stenosis of the right auricular ventricular orifice, either as a concomitant or as a consequence of mitral stenosis. This brings most serious aggravation of suffering and adds greatly to danger; symptoms of embarrassed circulation, indeed, are never absent, and as a rule dropsy sets in and increases. It has been stated that tricuspid stenosis gives rise to a presystolic murmur in the tricuspid area; but in none of the cases, in which I have had *post mortem* evidence of mitral and tricuspid stenosis, have I met with such a murmur, and the evidence of the latter condition is usually inferred from symptoms rather than indicated by signs.

Up to the present, nothing has been said of the co-existence of mitral regurgitation with stenosis. This is common, though less frequent than might have been expected.

An exact diagnosis under these circumstances is difficult, and the constriction is liable to be entirely overlooked. There will be the systolic apex-murmur of regurgitation, and on hearing this familiar sign it is frequently accepted as a sufficient explanation of the case. So long, however, as a presystolic murmur and thrill are present, they will at once arrest the attention of the careful observer, but when there is no presystolic murmur, great care is required for the recognition of the stenosis. Here the short sharp first sound, not extinguished by the murmur, is of great importance. The pulse, in such cases, may either be regular or irregular. Marey states that stenosis neutralises the tendency to irregularity characteristic of incompetence; my own experience would be better expressed by saying that incompetence introduces a tendency to irregularity into stenosis, and that especially it brings on irregularity early when complications arise. In some cases, however, stenosis, in others incompetence, will predominate, and it is extremely difficult to say in a given case which is the more influential lesion.

Summing up the prognostic indications, it must be borne in mind that mitral stenosis is the most dangerous of the valvular diseases, with the exception of aortic regurgitation, coming on at or after middle age, and that the appearance of the sufferer may be very deceptive, the subject of this affection often looking very well at a time when danger is imminent.

It is again frequently fatal in early life; so that, while we may hope for the establishment of compensation in aortic and mitral regurgitation affecting young subjects, we must be apprehensive of progressive mischief and comparatively speedy death in mitral stenosis.

In endeavouring to estimate the degree of constriction of the orifice, which is the most important element in prognosis, we are not greatly assisted by the extent of dilatation and hypertrophy of the cavities and walls of the heart, but a careful study of the sounds and murmurs affords some information. When, with the presystolic murmur, a fairly good first sound and a distinct second sound are heard at and beyond the apex, there is, according to my experience, little or no liability to the recurrence of symptoms. With the disappearance of the second sound at the apex, and the establishment of the short sharp character of the first sound, there comes a liability to complications and cardiac troubles, and these complications and evidences of cardiac difficulties may come on very abruptly. A prolongation backwards of the presystolic murmur, so that it occupies the entire diastolic interval, or becomes diastolic in time, adds to the gravity of the indications; so also does disappearance of the presystolic murmur, especially when it coincides with tricuspid regurgitation. Of the prognosis, when pulmonary complications or dropsy are present, there is scarcely time to speak; but it must be mentioned that, among the special contingencies of this affection, is embolism, which may occur almost at any stage. Finally, sudden death is not uncommon, though not in the sense of falling down dead while in apparent health; there is a liability to the sudden and unexpected setting-in of severe symptoms in patients already suffering, which rapidly issue in a fatal termination.

BICHLORIDE OF METHYLENE BEFORE THE ACADEMY OF MEDICINE OF PARIS.

By F. E. JUNKER, M.D.

CONFLICTING statements about the so-called bichloride of methylene, its value as an anæsthetic, and the correctness of the various analyses of this preparation instituted by chemists of scientific repute merely on scientific grounds, and which all tend to a like result, have lately been brought before the profession. This question was fully ventilated at two meetings of the Academy of Medicine of Paris, by two men of high authority, and whose opinion and experience are of no mean weight with those conversant with the different departments of science they represent: by M. Regnaud, Professor of Chemistry in the Faculty of Medicine; and M. Léon Le Fort, surgeon to the Hôtel Dieu, both members of the Academy of Medicine of Paris.

In a paper read by M. J. Regnaud at the meeting of April 24th, 1883,¹ the author alludes to the numerous attempts, both of physiologists and of chemists, to find a substitute for chloroform, ether, and protoxide of nitrogen, possessing equal anæsthetic but less dangerous properties. Several such substitutes, which were the subject of special monographs and treatises, were in turn praised, or even extolled, but soon abandoned and forgotten. From these failures, however, must be excepted the chloride of methylene, or chlorinated chloride of methyl, a preparation nearly allied in composition to chloroform, which, first introduced under the name of bichloride of methylene by Dr. B. W. Richardson in 1867, owes its reputation, as an anæsthetic at once safe and free from some of the objectionable effects of chloroform, to no less eminent an authority than that of Sir Spencer Wells, whose remarks on it, in his *Ovarian and Uterine Tumours*, M. Regnaud quotes in full.

In France, the chloride of methylene had not been tested until lately, when M. Léon Le Fort, after the perusal of Sir Spencer Wells's work, found it incumbent on him to avail himself of the superior qualities of this anæsthetic, particularly in the domain of abdominal surgery. M. Le Fort, knowing that M. Regnaud had been making the chemistry of anæsthetics the subject of his special study and investigation, requested him to procure some pure chloride of methylene. M. Regnaud, therefore, conjointly with M. E. Villejean, subjected the preparation sold under this name by different manufac-

¹ "Recherches Pharmacologiques sur le Chlorure de Méthylène," par MM. J. Regnaud et Villejean (*Bulletin de l'Académie de Médecine de Paris*, 17 session d'Avril 24, 1883, I, xii).

turing chemists to a careful analysis, but failed to discover a trace of monochlorinated chloride of methylene in any of the samples. They consisted, without exception, merely of chloroform, with an addition of a small quantity of alcohol (ordinarily used for its preservation). Whilst Professor Regnaud was engaged in his laboratory in preparing and purifying a sufficient quantity of chloride of methylene for the use of M. Le Fort, the latter, anxious not to delay his experiments with this anæsthetic, obtained some direct from Sir Spencer's own purveyor. This, as well as a second supply from the same source—altogether two kilogrammes (4 lb. 6½ oz.)—after most careful examination, led M. Regnaud to the following conclusions, which I here translate *verbatim*.

"Chloride of methylene, CH_2Cl_2 , had originally been obtained by the action of solar radiation on a mixture of chloride of methyl, CH_3Cl , and chlorine. Afterwards, it was prepared by the reaction of chlorine on iodide of methylene (Boutleron).² The identity of the chemical preparations produced by these two different reactions was at first not understood, but was soon proved by Perkin.³ This chemist has, moreover, ascertained that the boiling-point of chloride of methylene, or monochlorinated chloride of methyl, is not $+30.5^\circ\text{C}$. (86.9°F .), as hitherto erroneously accepted, but that the real boiling-point of this preparation, by whatever process it may have been produced, is invariably 40.41°C . ($104.105.8^\circ\text{F}$.), under a pressure of 0.76.

"The same methyl-compound may also be obtained by various other processes, especially by the combined action of zinc and ammonia on an alcoholic solution of chloroform. The hydrogen, engendered by the reaction of zinc and hydrochloric acid, likewise produces in this solution a considerable proportion of chloride of methylene (Greene).⁴ By the latter method, slightly modified by previously distributing finely triturated copper on the surface of the zinc-shavings, we succeeded in preparing chloride of methylene of perfect purity (CH_2Cl_2). We considered such a standard preparation indispensable for comparisons in our future researches.

"Before entering into a more minute examination of the chemical composition of the English chloride of methylene, we tested the densities of this preparation and of our standard fluid by the metric method, at $+15^\circ\text{C}$. (59°F .), viz.:

Pure chloride of methylene	...	1.334
English "	...	1.363

Whilst the density of our preparation nearly corresponds with that found by Perkin, 1.360 at 0°C . (32°F .), or 1.332 at $+15^\circ\text{C}$. (59°F .), the density of the English chloride of methylene, 1.363, is too high, which tends to prove that chloride of methylene does not, or at least not exclusively, enter into its composition.

"Thus having ascertained that the fluid under examination is a compound, we tried to separate by successive distillations the chloride of methylene, supposed to be one of its components, from the unknown admixture which increased the density of the preparation.

"After having verified by crucial test the correctness of the boiling-point of our standard chloride of methylene, 40.41°C . ($104.105.8^\circ\text{F}$.), we intended to collect in Schloesing's apparatus all the liquid boiling between 40° and 45°C . (104.113°F .), and to separate it from the fluid condensing at 45.50°C . (113.122°F .). But, to our surprise, no distillation took place between 40.50°C ., and only after the temperature had been raised to 53°C . (127.4°F .) the thermometer remained steady, whilst almost the whole quantity of the fluid under examination (about 500 grammes, or 18 ounces) boiled and condensed.

"A small quantity of the fluid, which did not pass over, manifested on examination after cooling the characteristic odour of methylic alcohol, the correctness of which similarity was proved by the transformation of the residue into crystalline oxalate of methyl. In order to separate the component which boils at 53°C . (127.4°F .) from the methylic alcohol, the presence of which was indicated by the residue, we utilised the property of the anhydrous chloride of calcium of forming with this alcohol a solid and crystalline combination, which we supposed to be insoluble, or at least very little soluble, in chloride of methylene. This process perfectly succeeded. The addition of a minute excess of chemically pure and finely powdered chloride of calcium gave rise to the development of heat, to the formation of a voluminous crystalline deposit, and of a colourless, very mobile, perfectly transparent supernatant fluid.

"The examination of both, of the crystalline deposit and of the supernatant fluid, enlightened us beyond doubt as to the nature and real constitution of the supposed chloride of methylene. The crystals, after having been freed by a pipette from the fluid, were first treated with distilled water, whereby they dissolved into an aqueous solution

of chloride of calcium impregnated with methylic alcohol. We separated and purified the latter, and finally almost entirely converted it into crystalline oxalate of methyl,⁵ which distilled between 160.165°C . (320.329°F .). The boiling-point of the supernatant fluid, which has a density of 1.407 at $+15^\circ\text{C}$. (57.2°F .) lies between 60.61°C . ($140.141.8^\circ\text{F}$.). Its transformation into formate of sodium and chloride of sodium, by the action of an alcoholic solution of hydrate of sodium, leaves no room for doubting its identity with chloroform.

"We investigated, further, the proportion of chlorine contained in this compound, and found, in 100 parts: of the English preparation, 77.53; of pure chloride of methylene, CH_2Cl_2 , (our standard preparation), 83.52; of chloroform, CHCl_3 , 89.12. This smaller proportion of chlorine present in the English preparation confirms former experience, and shows that the latter consists of chloroform dissolved in a non-chlorinised substance.

"Taking as the basis of our calculations the difference of the weight of chlorine in this preparation and in chloroform, we find that it will require to dissolve in a given weight of chloroform one-seventh of methylic alcohol.⁶ If it be permitted to apply a scientific term in such a case, we may say that we realised the composition of the English preparation supplied to M. Le Fort by mixing chloroform and methylic alcohol in the above stated proportions (viz., seven parts of chloroform and one part of methylic alcohol by weight, or four parts of chloroform and one part of methylic alcohol by measure. Such a mixture has exactly a density of 1.363⁷ and a boiling-point of invariably 53°C . (127.4°F .), which is important⁸ to bear in mind, and separates by the action of chloride of calcium into chloroform and crystallisable methylic alcohol.

"Therefore, the French preparations sold as chloride of methylene, were only chloroform; and the very expensive bichloride of methylene,⁹ which we obtained on two different occasions from England, proved to be a mixture of chloroform and methylic alcohol, in the proportions of 7 parts of chloroform to 1 part of methylic alcohol, by weight, or 4:1 by measure."

Professor Regnaud concluded his paper with the remark, that it did not lie within his province to inquire into the cause of these errors, or accidental substitutions. His task was to point out the necessity of investigating the physiological properties, and, still more, the therapeutic action of a medicament, the chemical character of which had been incompletely investigated or erroneously interpreted.

M. Léon Le Fort, at the following meeting of the Academy, submitted his experience of the chloride of methylene.¹⁰

"The paper read by my colleague, M. Regnaud, treating of the purely chemical part, needs to be completed by a few practical remarks on the employment of the chloride of methylene as an anæsthetic. On several previous occasions, my surgical colleagues, and especially M. Perrin and myself, commented before this Academy on the frequency of vomiting during and after the administration of chloroform, which, causing great annoyance to the operator in general surgery, is fraught with particular danger in abdominal surgery, especially in operations on the sexual organs of women.

"Reading Sir Spencer Wells's *Ovarian and Uterine Tumours*; I was struck by the statement of this eminent surgeon, that he had entirely discarded the employment of chloroform, on account of the frequency of vomiting caused by it; and that, in more than one thousand operations, he had used the bichloride of methylene, from which vomiting was quite exceptional. My anxiety to secure the same advantages for my patients was natural; and I at once procured the apparatus always used by Sir Spencer Wells for its administration, and ordered chloride of methylene from the hospital dispensary. But, before using this

⁵ Methylic oxalate, or oxalate of methyl, $\text{C}_2\text{O}_4(\text{HO})_2$, crystallises in glistening plates, which melt at 51°C . (123.8°F .), and boil at 162°C . (323.6°F .). It is frequently employed in the preparation of pure methylic alcohol (*Elements of Chemistry*, by W. A. Miller, H. Armstrong, and Ch. Grove, 5th edition, vol. iii, p. 928).

⁶ Five litres of the mixture by measure contain four litres of chloroform and one litre of methylic alcohol.

⁷ English and French chloroforms and methylic alcohols having different densities, a mixture composed of English preparations in the indicated proportions has a density of 1.37 to 1.35. In order to obtain the density given by Regnaud, 1.363, it would be necessary to mix the two components in the proportion of 72:1.

⁸ The importance of this statement must be evident when we compare it with that of the Messrs. Robbins, who, in speaking of their preparation, say: "We now distil the methylene at about 127° to 128°F .; and, as a rule, never varying more than 3 degrees from the first to the last part of the distillation." (See J. Robbins and Co., *BRITISH MEDICAL JOURNAL*, August 11th, p. 271.)

⁹ The name "bichloride of methylene," under which this preparation has hitherto been sold, has since been altered to that of "methylene," and the very assailable chemical formula has been omitted.

¹⁰ "Emploi du Bi-chlorure de Méthylène pour l'Anesthésie Chirurgicale," par MM. Léon Le Fort et J. Regnaud. (*Bulletin de l'Académie de Médecine de Paris, Session du Mai 1, 1883*).

² *Bulletin de la Société Chimique*, 1869, t. xii, p. 269.

³ *Chemical Society*, 1869-1870, vol. vii, p. 260.

⁴ *Comptes Rendus*, 1879, ii.

preparation, I secured the co-operation of my colleague, M. Regnaud, who examined the sample, and found it to be nothing else but chloroform, which it also resembled in appearance and odour. I bought so-called chloride of methylene of our most respected chemical firms, but the result of its examination was the same. I then wrote to Sir Spencer Wells, who furnished me with the name and address of his purveyor, from whom I obtained a preparation which, neither from its odour nor otherwise, appeared to me identical with chloroform. M. Regnaud, after examination, declared that it was not common chloroform, but neither chloride of methylene, the boiling-points being different. The opinion which he formed, after subsequent careful analysis, is embodied in his paper read at the last meeting. I accept his conclusions, being incompetent to discuss the chemical part of the question, and the result of his analysis; but I feel bound to add that my clinical observations are at variance with the latter. This preparation has given me excellent results, far superior to those of the best chloroform.

After describing the apparatus and the mode of administration, M. Léon Le Fort continues.

"I have continually used the chloride of methylene since February last (1883) for producing anaesthesia in all my operations, and I beg now to state the result of my experience. At first, its action appeared to me less rapid than that of chloroform; but this I have to put on account of the manner in which it was given. I first propelled the air through the anæsthetic only at every fifth or sixth respiration of the patient. Since, however, I have become more familiar with the apparatus, and have gained confidence in the preparation, I have pressed the bellows at every inspiration, and thus produced narcosis as rapidly as when using chloroform. I found that the stage of excitement was of less intensity and shorter than with chloroform. Above all, there was no sickness. As regards the latter point, I was delighted with this preparation, whatever it be. I only once had vomiting; but in this case the patient had a hearty meal one hour before the operation. Patients narcotised in this manner never suffered from the *malaise*, headache, or nervous condition which generally follow for one day after the use of chloroform. One patient vomited during the night after the operation, which had been performed the previous morning; too long a time after the administration of the anæsthetic to make it answerable.

"It would be premature to draw scientific conclusions from my still limited experience, which extends only somewhat over three months. It needs comparing the effects of chloroform given in the same apparatus, the effects of chloride of methylene given in the manner in which chloroform had been hitherto usually administered—viz., without Junker's apparatus. I ought to compare, with the assistance of my colleague M. Regnaud, the effects of the English preparation with those of the mixture of chloroform and methylic alcohol propounded by the latter. Before all, I shall have to compare the pure standard chloride of methylene with the spurious preparation. This will require time; and my present remarks are only elicited by M. Regnaud's paper. I have full reliance on chemical evidence, but still chemistry fails sometimes in explaining what we occasionally succeed in appreciating without her aid—viz., the difference between the bouquet of Chamberlin and Pomard. It may be that in the English compound, whatever it may be, some subtle changes take place, which chemists cannot point out, but which benefit our patients. I conclude by asking my colleagues to join me in my researches and experiments with this preparation, which I have found superior to the best chloroform. I shall certainly use the mixture of chloroform and methylic alcohol prepared according to M. Regnaud's formula; but in the meantime I shall continue with the chloride of methylene, because I have had no vomiting caused by it, and it has given me far superior results than the best of our chloroforms. (Parcequ'avec lui je n'ai pas encore rencontré de vomissements; et qu'il m'a donné des résultats de beaucoup supérieurs à ceux que me donnent les meilleurs de nos chloroformes.)"

In his reply, M. Regnaud reiterated his evidence that the English preparation, of which he analysed two kilogrammes, supplied to him on two different occasions, was not pure chloride of methylene, but was a compound of four parts of chloroform and one of methylic alcohol by measure (or of 7:1 by weight), to which the term bichloride of methylene and the formula CH_2Cl_2 was misapplied. He does not wonder at the good effects of this preparation, as the methylic alcohol, discovered by the eminent chemist M. Dumas, who was present at this meeting, also possesses narcotic properties.

Since the publication of my paper, and the cases in which I gave Regnaud's anæsthetic mixture (BRITISH MEDICAL JOURNAL, July 21st, 1883, p. 211), I have had, through the kindness of my friend Dr. G. Granville Bantock, the opportunity of administering the latter: four parts of chloroform and one part of methylic alcohol by measure,

in twenty cases, both in the Samaritan Free Hospital and in private practice. Of these, fourteen were abdominal sections for the removal of one or both ovaries and of myomas of the uterus; three were operations for ruptured perinæum, two for the removal of fungous growths in the uterine cavity by means of the curette, and in one case a bundle of enlarged and infiltrated glands was extirpated from the axilla, subsequently to an amputation of the breast.

The ages of the patients ranged between 23 and 69 years. In all these cases, the heart was free from any affection; the pulse at the commencement of the anæsthesia varied; owing to the different degrees of nervousness, which always prevails more or less before an operation, it became quiet when full narcosis took place, and ranged, after the operation, from 68 to 90. The rhythm of the respiration remained normal. The pupils dilated during the first stage of the anæsthesia, but became either normal or slightly contracted after complete narcosis had taken place. Muscular excitement, sickness during and after the narcosis, were absent in every case. The complexion was either unaltered or slightly flushed, never haggard or cyanotic; the skin moist from gentle warm perspiration. The patients appeared as if in normal sleep, and awoke to full consciousness soon after stopping the administration of the anæsthetic mixture.

I submit a table, showing the quantity given and the time required to produce full narcosis in each individual case, and the quantity given and the time from the commencement to the termination of the administration. According to mean calculation, $1\frac{1}{2}$ drachms produced complete narcosis in 6 minutes (36 drachms, 120 minutes), and $8\frac{1}{2}$ drachms were given in one hour (172 drachms in 20 hours).

	Age.	Operation.	Complete Narcosis produced by		Amount given.	Duration of Administration.
			dr.	in		
1	42	Ovariectomy	1	5 m.	4 drs.	30 m.
2	28	"	1	5 "	8 "	1 h. 45 m.
3	45	Removal of fungous growths from uterine cavity (curette)	2	7 "	10 "	46 m.
4	32	Perineal operation	1	4 "	6 "	40 m.
5	38	Ovariectomy	2	5 "	10 "	2 hours
6	42	"	1	5 "	5 "	45 m.
7	32	Removal of fungous growths from uterine cavity (curette)	1	5 "	5 "	40 m.
8	60	Ovariectomy (double)	2	9 "	12 "	1 h. 35 m.
9	44	Removal of myoma (laparotomy)	2	5 "	16 "	2 h. 20 m.
10	32	Perineal operation	2	10 "	6 "	40 m.
11	28	Ovariectomy	2	5 "	6 "	40 m.
12	38	"	2	4 "	6 "	31 m.
13	46	"	2	7 "	10 "	1 hour
14	69	"	1	5 "	8 "	1 hour
15	28	"	2	8 "	11 "	55 m.
16	49	"	2	8 "	5 "	35 m.
17	23	"	1	7 "	13 "	1 h. 33 m.
18	30	Perineal operation	2	5 "	14 "	1 h. 30 m.
19	30	Extirpation of glands from axilla	3	8 "	7 "	40 m.
20	43	Ovariectomy (double)	1	5 "	10 "	1 h. 15 m.
			36	120	172	1200

NEPHROTOMY FOR OBSTRUCTIVE SUPPRESSION OF URINE.

By BENNETT MAY, F.R.C.S.,

Surgeon to the Queen's Hospital, Birmingham.

I HEARTILY concur with Mr. Clement Lucas in regarding the case published by Mr. T. Wilmot, in the JOURNAL of November 24th, 1883, as one eminently suggestive of the propriety of operative treatment in this disease.

As Mr. Lucas, in his letter of December 1st, refers to a communication I made on the subject after his address on Renal Surgery, at Liverpool, I shall be glad of this opportunity of expressing, in a more precise and extended form, the suggestion I then made for operative measures in these cases.

In anuria from impacted calculus, urine does not ordinarily accumulate in the loin to any appreciable degree. Dilatation only takes place where the obstruction is partial in degree and of long duration. Where it is sudden and complete, no dilatation occurs, because the secretion is arrested directly the pressure is equalised; and, under these circumstances, not more than half an ounce of urine will be found in the pelvis of the kidney (*vide* case by Dr. Roberts, *Lancet*, June 1870); though ultimately, as the experiments by Strauss have shown, the organ may become converted into a cyst. The usual seat of impaction